TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON

SYSTEM SAFETY PROGRAM PLAN

October 2018

TriMet System Safety Plan Approvals

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Oct 17/18
Date

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10/17/18
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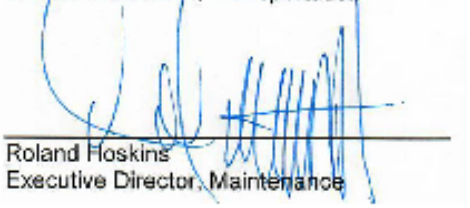

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System Safety Program Plan Revision History

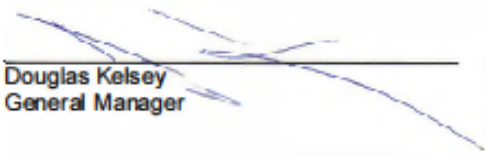
Date	Revision	Description of Change
July 15, 2005	0 - 7.05	Initial document (replaces March 2003 System Security Program Plan) - approved by ODOT State Safety Oversight April 13, 2006
April 14, 2006	1 - 4.06	Revision 1 - 2006 annual update - reflecting 12/05 comments on revision 0 by ODOT State Safety Oversight - reflecting 8/05 comments on revision 0 by FTA Project Management Oversight - update to System Security Policy, and to Objectives and Tasks (section 1.2.2) - annual update of data and factual content, throughout document - sections added: 4.2.1.1; 4.2.5.4; 4.2.6; 5.3; 5.4; and 5.5 - appendix added: I
November 2008	2 – 11.08	Revision 2 – 2007/2008 annual update, WES Commuter Rail Opening
July 2009	3-7.09	Revision 3 – Green Line Opening
September 2011	4-11-11	Revision 4 – SEPP Updated based on annual review
February 2-13	5-2-13	Revision 5 - Budget Information
March 2015	6-2-15	Revision 6 - organizational update - Orange Line opening - statistics update
February 2017	7-2-17	Revision 7 - revised safety policy statement - organizational update - statistics update - updated NTSB recommendations corrective actions - updated hazard matrix - specified the minimum number of exercises to be held annually - grammatical
October 2-18	8-2-18	Revision 8 - organizational update (organizational structure and personnel changes) - revised RACI chart - minor text clarifications - updated ODOT immediate and 24-hour notification requirements - updated FTA notification requirements

TriMet Safety Policy

Safety is a core value and essential business function of TriMet. TriMet is committed to developing, implementing, maintaining, and continually improving standards and procedures to ensure the highest practicable level of safety performance. All transit service activities, from planning through operations, should receive a balanced allocation of organizational resources to support this goal.
TriMet is committed to:

- Integrating safety management among the primary responsibilities of all managers and employees;
- Clearly defining, accountabilities and responsibilities for the delivery of TriMet's safety management system performance for all levels of staff;
- Supporting safety management with appropriate resources;
- Valuing safety management as highly as other TriMet management systems;
- Developing an organizational culture that fosters safe practices, and encourages effective employee safety reporting and communication;
- Establishing and implementing hazard identification procedures, including employee safety reporting and the analysis and evaluation of safety risks in order to eliminate the safety risks resulting from all activities to an acceptable level of safety;
- Complying with TriMet safety requirements and standards;
- Ensuring that all staff are provided with adequate and appropriate safety-related information and training;
- Establishing and measuring TriMet safety performance against realistic, data-driven safety performance standards;
- Continually improving our safety performance through management oversight that ensures appropriate and effective actions are taken; and
- Ensuring externally supplied systems and services meet TriMet safety performance standards.

All levels of TriMet's management and employees are accountable for the highest practicable level of safety performance, starting with the General Manager.



Douglas Kelsey
General Manager

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The Tri-County Transportation District of Oregon (referred to herein as “District”) operations are dependent upon the proficiency and well-being of its employees and maximizing its capital resources. To ensure preservation and safety of these resources, TriMet adopted a comprehensive safety management system, with system safety as its foundation, as the model for safety management and continuous improvement in safety performance.

The system safety management plan (SSPP) serves as a guideline in the establishment of technical and managerial safety strategies for the identification, assessment, and control of safety risks to TriMet customers, employees, the public and others who may come into contact with the system.

A.1 Purpose

Specifically, the Plan:

- States the District's commitment and philosophy to actively sustain safe transit operations;
- Establishes and manages safety activities intended to minimize risk and loss of District resources, and to maximize the safety of the public;
- Integrates the safety function throughout the District's organizational structure, from the General Manager, to managerial staff, to front-line employees;
- Defines organizational safety responsibilities and accountabilities;
- Provides for the documentation and verification of safety activities; and
- Evaluates safety activities for continued improvement.

System safety is defined as the District-wide coordinated effort of all divisions to apply operating, technical, and risk management techniques and principles to conserve life and property; prevent and reduce mishaps or incidents, and the effects which result; and to maintain a safe and healthful work environment.

The SSPP applies to all TriMet all operations; including bus, light rail, and para-transit; all supporting divisions; and to all activities, which involve the design, construction, operator, and maintenance of the transit system, including system expansions. Each TriMet division and department is charged with the responsibility for the implementation and success of the plan. Appendix A provides a detailed description of the District operating system.

TriMet’s commuter rail system safety program is covered under a separate SSPP. The commuter rail system safety program plan conforms to the requirements of the Federal Railroad Administration’s (FRA) rule, 49 CFR Part 270 – System Safety Program.

Because of the confidential nature of TriMet security measures, the TriMet Security Management Plan (SMP) is maintained separately from the SSPP. The SMP describes the policies, objectives, responsibilities and procedures in providing a coordinated effort for the personal security of employees and customers and the physical security of TriMet assets.

The SSPP provides the foundation for a continuing safety effort that begins with the planning of operations, facilities and equipment, and continues into the operational phase. This section identifies and describes the overall safety requirements and activities directed towards achieving the established District safety goals and objectives.

B. GOALS AND OBJECTIVES

B.1 Goal

The safety goal is to design, construct, test, and operate a transportation system that attains an optimum level of safety through the effective management of safety risks. This goal is reflected in the planning, design, construction, operation, and maintenance phases.

The SSPP is directed toward achieving this goal within the District's strategic goals and constraints.

Achievement of the goal is accomplished, in part, through the application of a formal system of analytical techniques and methods for the identification, analysis, evaluation, and resolution of safety risks.

B.2 Primary Objectives

The primary objectives of the SSPP are to achieve a level of safety performance that meets or exceeds the operating experience of similar bus and light rail transit systems in the United States through:

- Analyzing employee and passenger injuries;
- Using industry standards for the identification, assessment, evaluation, and mitigation of hazards that may impact customer and employee safety and those that may be affected by rail and bus operations;
- Incorporating safety, fire protection, and emergency management measures into design criteria and specification development and in all transit system designs;
- Analyzing bus and light rail vehicle collisions, mishaps and other incidents;
- Training TriMet personnel in safety related programs and ensure that safety certifications are up to date and maintained;
- Complying with OR-OSHA rules, local codes and federal, state, and local environmental regulations;
- Increasing and strengthening community engagement in the safety of the transit system by involving and educating community organizations and schools in bus and light rail safety;
- Promoting transit safety through campaigns, promotional contests, and other activities;
- Improve planning and projections for fiscal support needs by tracing and analyzing historical data; and
- Coordinating and communicating safety risks with jurisdictional partners and the Oregon Department of Transportation (ODOT) Office of Rail Safety.

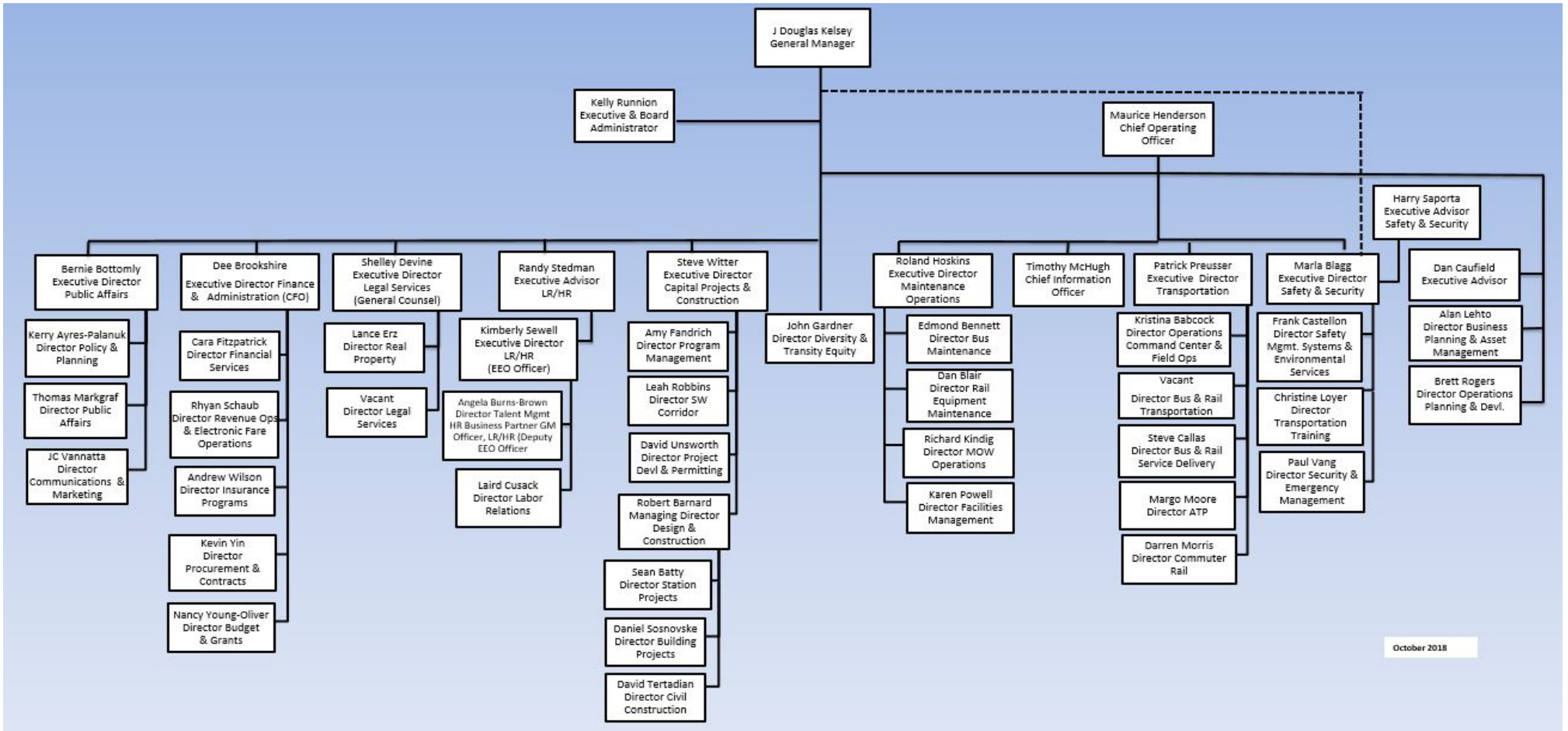
C. OVERVIEW

Each level of the District organization, from the Executive Office to individual District personnel, is assigned responsibility for ensuring TriMet operations provide for the safety of customers, the public and District personnel, in accordance with the SSPP.

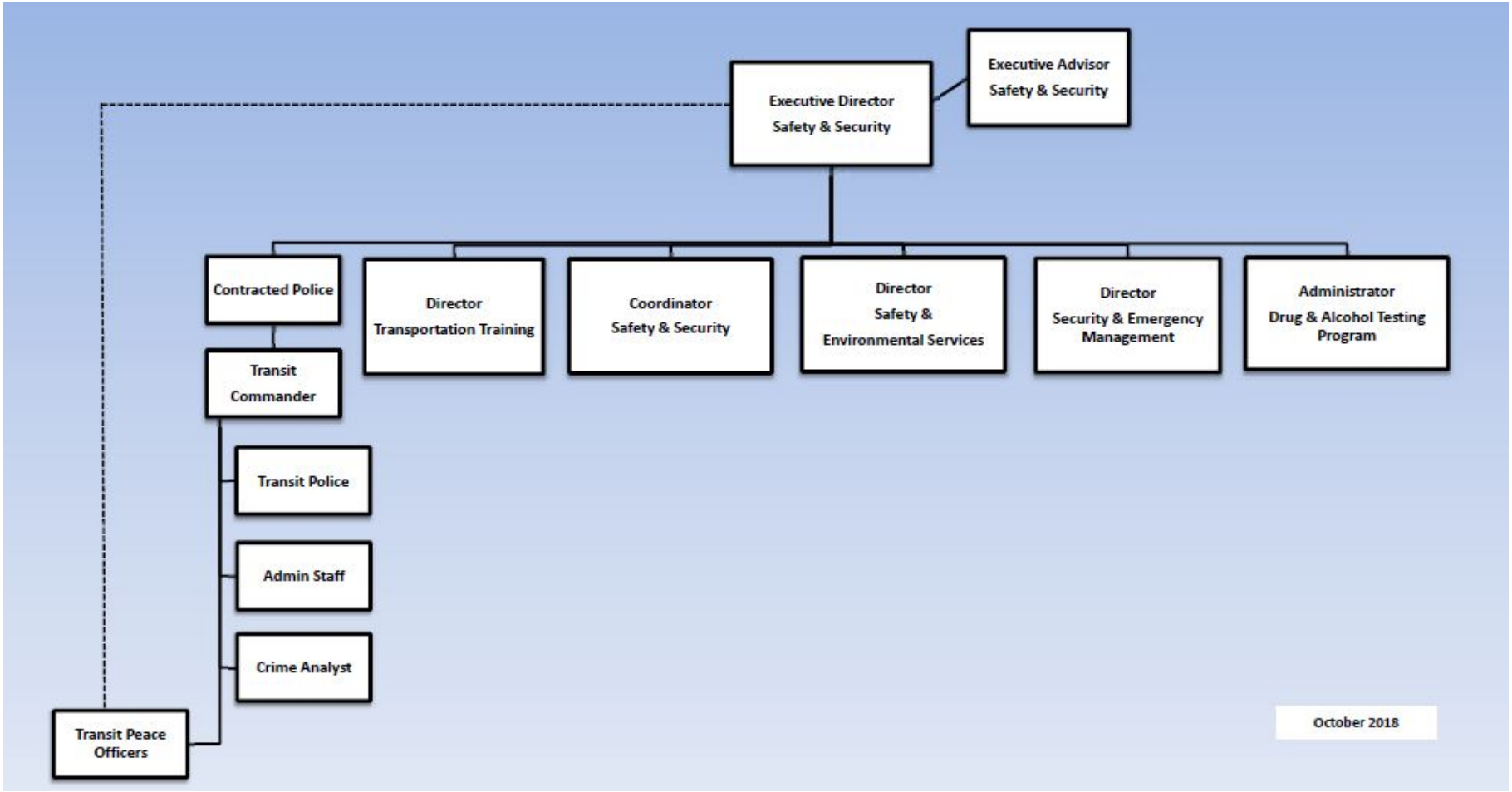
Included in this document are:

- An organization chart (C.1 of this section).
- The Organizational Structure of the Safety, Security and Environmental Services Department (C.2 of this section).
- A Safety Task Matrix indicating primary responsibility and oversight (C.4 of this section).
- A description of the system (see Appendix A)

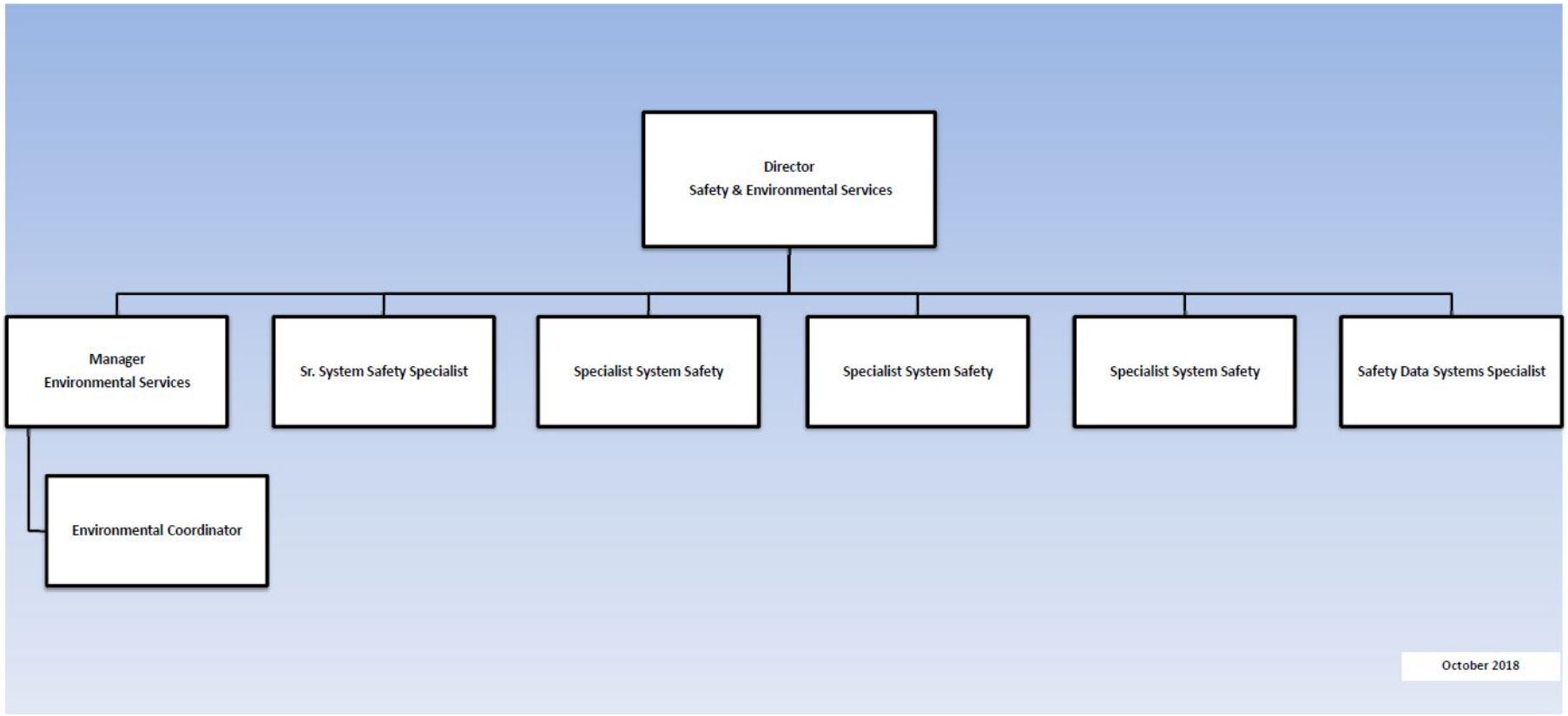
C.1 TriMet Organizational Chart



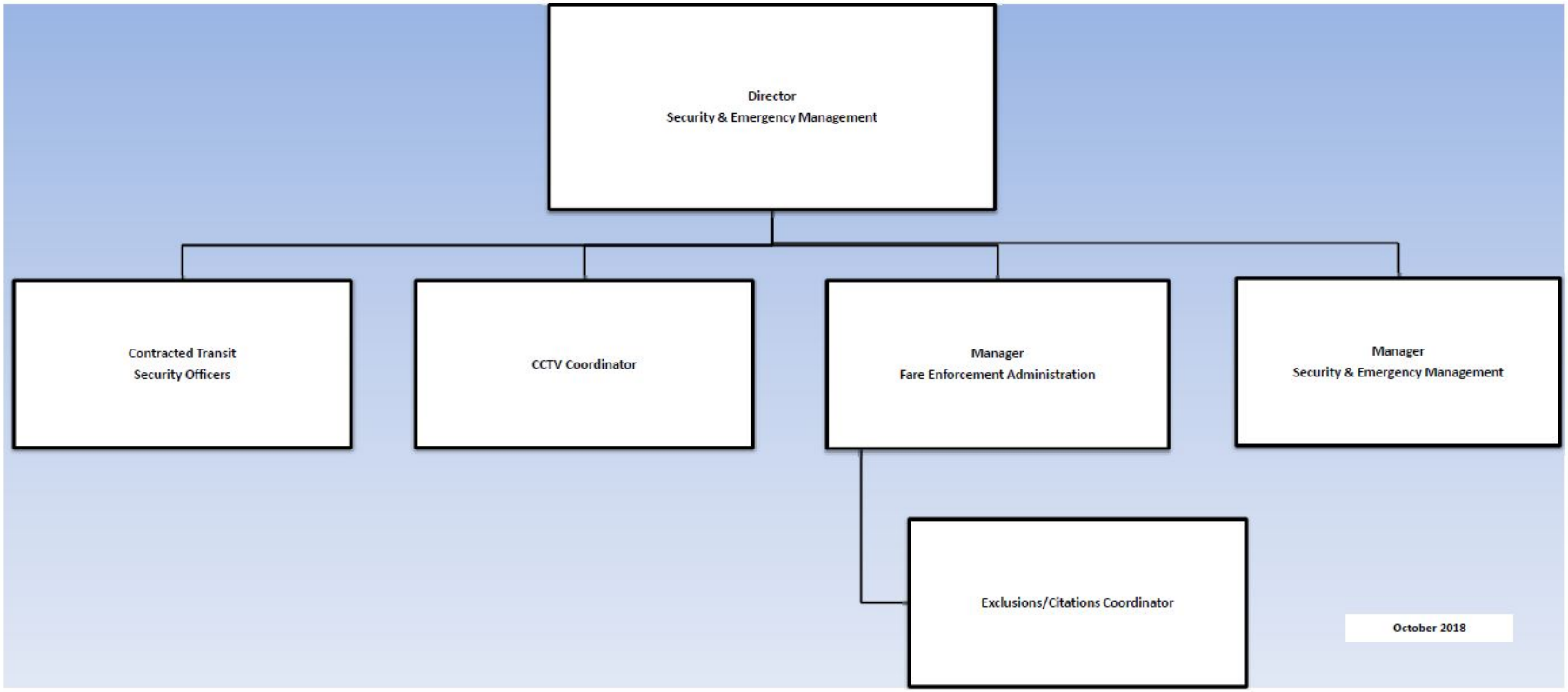
C.2 TriMet Safety, Security and Environmental Division



C.2.1 TriMet Safety Department



C.2.2 TriMet Security Department



C.3 Safety Integration and Lines of Authority

The SSPP responsibilities at each organizational level are outlined as follows:

General Manager – is vested with the primary responsibility for the activities of the District. The General Manager has designated the Safety, Security and Environmental Services Division (SSES) with the responsibility for implementing and managing the District SSPP.

Chief Operation Officer – is the Accountable Executive for the TriMet System Safety Program and responsible for the overall safety activities of the District and overall safety performance.

Executive Directors - are responsible for upholding and promoting safety policies, developing safety performance goals, and for holding department directors and managers accountable for the safety performance within their respective divisions/departments.

Department Directors and Managers - are directly accountable and responsible for safety performance within their functional area. This responsibility includes determining and implementing countermeasures required to counteract safety risks and problems that negatively impact TriMet safety performance.

Supervisors - Supervisors are accountable and responsible for the safety performance of all personnel and equipment under their supervision, implementing and maintaining control measures, and for reporting all mishaps and incidents to the SSES.

District Personnel - all personnel are responsible for performing their work safely, following procedures and rules, calling attention to circumstances that may impact safety performance and for reporting mishaps and incidents to their Supervisor, in accordance with established requirements for the protection of themselves, co-workers, customers, facilities, and equipment.

C.4 Safety Accountabilities and Responsibilities Matrix

Safety Tasks and Activities	Chief Operating Officer	Transportation Executive Director	Maintenance Executive Director	Rail and Bus Transportation Managers	LRV and Bus Maintenance Managers	Rail MOW Manager	Field Operations Manager	Facilities Director	Capital Projects Executive Director	Contracts & Procurement Director	Human Resources/Labor Executive Director	Internal Audit Manager	Safety & Security Executive Director
Goals & Objectives	A	C	C	C	C	C	C	C	C	C	C		R
SSPP Control & Update	A	C	C	C	C	C	C	C	C	C	C		R
Hazard Management Process	C	R	R	R	R	R	R	R	R	R			A
System Modifications	A	R	R	R	R	R	R	R	R	I			C
Safety Certification	C	R	R			R		R	R				A
Safety Data & Acquisition	A	R	R	R	R	R	R	R					R
Accident Notification, Investigations & Reporting	A	R	R	R	R	R	R	R	R				R
Emergency Management	A	C	C	C	C	C	C	C	C				R
Internal Safety Audit Process	A	C	C	C	C	C	C	C	C	C		R	R
Rules Compliance	A	R	R	R	R	R	R	R					C
Facilities and Equipment Inspections	A		R		R	R		R	C				C
Maintenance Audits and Inspection	A		R	R	R	R		R	C			R	R
Training and Certification Program	A	R	R	R	R	R	R	R			C		R
Configuration Management	A	R	R	R	R	R	R	R	R				C
Local, State & Federal Requirements	A	R	R	R	R	R	R	R	R	I	R	I	C
Hazardous Materials	R		R		R	R		R	I	I			A
D & A Program	A	R	R	R	R	R	R	R		R	R		R
Procurement	R	R	R	R	R	R	R	R	R	A			C
Hours of Service	A	R	R	R	R	R	R			I	I		C

R = Responsible
A = Accountable
C = Consult
I = Inform

D. SYSTEM SAFETY PROGRAM PLAN REVIEW AND UPDATES

Development and preparation of the SSPP is in accordance with the documents below. Modification to these documents may result in updates to the SSPP as necessary to maintain conformance.

Federal Transit Administration (FTA) regulation: Rail Fixed Guideway Systems; State Safety Oversight, 49 CFR, Part 659;

FRA regulations as they pertain to the limited connection and seven highway-grade crossing for those segments in the Portland-Milwaukie segment of the Light Rail Transit (LRT) (see System Description):

- 49 CFR Part 214 - Roadway Worker Safety Program,
- 49 CFR Part 217 - Operational Testing Program,
- 49 CFR Part 220 - Radio Communications,
- 49 CFR Part 222 - Quiet Zones
- 49 CFR Part 225 - Accident/Incident Reporting and Internal Control Plan,
- 49 CFR Part 228 - Hours of Service – (Controllers and Signal Technicians only),
- 49 CFR Part 233 - Signal Systems Reporting (applicable only to the OPRR crossing)
- 49 CFR Part 234 - Systems for Telephonic Notification of Unsafe Conditions at Grade Crossings
- 49 CFR Part 236 - Railroad Signals Maintenance Standards (applicable only to the OPRR crossing)

ODOT regulation: ODOT State Safety Oversight Program Standards Oregon Administrative Rules (OAR) 741-060-0010 through 0110.

D.1 Updates

Changes in the transit system operational configuration; management organization; the environment in which the transit system operates; safety policies, goals, or objectives; or regulatory requirements may require revision of the SSPP and/or its implementation. The SSPP is reviewed annually to ensure that it remains current and effective.

The TriMet SSES is empowered and authorized by the General Manager to develop, implement, and administer the SSPP, through the Chief Operating Officer. The Director, Safety Management Systems and Environmental Services, within the SSES Department, is responsible for the SSPP review process. Revisions, if necessary, are coordinated and led by the SSES Executive Director acting under the authority of the Chief Operating Officer.

D.2 Reviews

The SSPP is reviewed during January of each year. The SSES Executive Director advises the Transit Change Review Committee (TCRC) of SSPP status. Significant changes to the SSPP, other than organizational updates and minor revisions, are submitted to TCRC for review. Any needed changes are incorporated into the document and sent to ODOT for review and approval in February of each year.

The focus of the review is to:

- Evaluate current safety tasks and initiatives for appropriateness.

- Refine and improve task descriptions and activities.
- Identify new tasks and initiatives, which may be required.
- Define organizational responsibility for accomplishing safety–related tasks.
- Incorporate organizational, operational, or legislative changes.

Reviews may be needed in addition to the annual review due to major system changes such as:

- Line Extensions
- New construction or modification of existing vehicles, facilities or system equipment
- Significant changes to operational practices
- Changes to Oversight regulations

E. HAZARD MANAGEMENT PROGRAM

A variety of strategies are used to identify, evaluate, and resolve safety risks within the TriMet transit system. The strategy used is dependent on whether the hazard pertains to the operational, design, construction, or renovation phase of the TriMet system.

E.1 New Extensions and Equipment and Renovations

Formal hazard assessments are conducted commencing with the preliminary engineering phase of each new rail extension and new rail transit systems equipment. Assessments are also conducted on other rail projects that include safety critical systems and changes to bus operations, including new bus routes. The assessments are designed to identify safety critical systems and consider hazardous components, interfaces, environmental constraints, as well as safety risks associated with operating, maintenance, and emergency procedures, and the effect on employees, passenger, the public, equipment, and infrastructure.

E.1.1 Historical Data and Trend Analysis

TriMet mishap/incident data, as well as data from similar operating light rail transit systems, provides insight as to what has happened in the past and what safety risks and hazardous conditions should be reviewed and considered for mitigation. This may include reviews of rule violations, rail and bus collision histories, and employee and passenger injury trends.

E.1.2 Design Reviews

The SSES participates in design reviews to identify conditions and events that may be hazardous to employees, customers or those who may come into contact with the TriMet system.

E.2 Operating System

Both formal and informal occupational and operational safety evaluations are conducted of facilities, equipment, and operating practice to identify hazards on a proactive basis.

E.2.1 Occupational Safety and Health Evaluations

The TriMet Occupational Safety and Health program is directed towards achieving a safe and healthful working environment for employees and minimizing the likelihood of mishaps. The program emphasizes the recognition, evaluation, and control of hazards arising in and from the occupational environment. Corrective action plans (CAP) are utilized where needed. Systems, processes and facilities are continually reviewed for hazards. This is accomplished through surveys, inspections, audits, committees, injury evaluations, and employee input.

Industrial Hygiene surveys are conducted to evaluate the degree of employee exposure to chemical, biological and physical agents encountered in the workplace. The survey results are utilized to determine the necessary corrective action, including implementation of engineering and administration controls and/or the required use of personal protective equipment.

The SSES department reviews employee injuries and illnesses, which are also reviewed by the appropriate safety committee.

E.2.2 Inspections

All TriMet operating and maintenance facilities undergo a complete inspection by the SSES at least once a year to ensure the safety of customers, and the safety and health of employees. Individual maintenance shops are inspected quarterly due to the nature of the hazardous environment. Inspection reports are issued which list the hazards and the safety or health problems found during the inspection. Follow-up inspections and reports are tracked to completion by the safety committees on a log kept with the committee meeting minutes and in the safety information management system.

E.2.3 Mishap/Incident Investigations and Data

Mishap and incident reports, injury and illness reports and workers' compensation databases are another method of hazard identification. In the investigation of major accidents and incidents an urgent review is conducted by the TCRC to develop a consensus determination of causal factors. Outside assistance may be sought with investigations when additional resources are needed. ODOT is invited to attend all urgent reviews.

All mishaps are reviewed by the Accident Review Committee and investigated by a Field Supervisor at the scene.

E.2.4 Audits

Audits are conducted by the TriMet Internal Audit Department and SSES, and include contracted services that support the audit process. The SSES ensures that the Internal Safety Audits required by the ODOT are conducted on a three-year cycle. The audit notifications are sent to ODOT at least 30days in advance of the audit. Following the audit, the resulting information is sent to ODOT for review and approval.

E.2.5 Ad hoc Hazard Reporting

It is the responsibility of all TriMet employees to report hazardous conditions. Hazards are reported to their Supervisor, or are called into the Operations Command Center (OCC), as circumstances dictate. Hazards reported to the OCC are logged into the Accident/Incident Database (ACID). Data is accumulated and used to identify actual and potentially hazardous conditions, which may compromise safety of passengers, employees, and those who may come in contact with the system. Such data may include injuries, potentially hazardous equipment failures, and rules and procedure violations. Additionally, tracking of hazard related data is used to identify trends, which may impact system safety goals and objectives.

Hazards that are deemed by Operations and/or the SSES to be an immediate threat to safety, for example icy platforms, are immediately corrected. Both Bus and Rail Operators report hazards to the OCC. These are paged out or sent to the appropriate manager for resolution. The general public also reports concerns by contacting Customer Service. These concerns are logged into the Service Improvement Process (SIP) database, routed to the correct person for resolution, and tracked until resolved.

The Confidential Safety Reporting (CRS) system and the Request for Safety Assessment (RSA) process allow all TriMet employees to submit safety concerns, with the CRS confidentially. All concerns are reviewed by the SSES and are tracked to completion. A written response is provided to each person who submits an RSA.

E.3 Hazard Categorization

In general, hazards identified through formal project hazard assessments - operating system investigations or evaluations that have resulted in, or have the potential to result in injury, fatality, or system loss; and operating system mishap/incident trend analyses - are categorized through a formal classification system. The hazard categorization system is used to determine the acceptability of assuming a risk associated with a hazard, the necessity of implementing mitigation measures to eliminate or reduce the hazard to an acceptable level of risk.

Hazard categorization involves classification of the hazard in terms of severity and probability. The United States Department of Defense document Standard Practice for System Safety, MIL-STD-882E, establishes system safety criteria guidelines for determining hazard severity and probability. TriMet has adapted the Risk Assessment and Hazard Risk Index matrixes for use in the hazard categorization process.

E.3.1 Hazard Severity

Hazards are rated in terms of their effect on TriMet customers, employees, the public, and the operating system. Hazard severity is a subjective measure of the worst credible case consequence that results from design inadequacies, component failure or malfunction, human error, environmental conditions, or operating or maintenance practice, and procedure deficiencies.

E.3.1.1 Hazard Severity Rating System

Severity	Characteristics			
	People	**Equipment/ Services**	**Financial**	**Reputational**
Catastrophic I	Several deaths and/or numerous severe injuries	Total loss of equipment or system interruption, requiring months to repair	Estimated loss from the incident in excess of $5 million	Ongoing media coverage, irreparable reputational damage, government intervention Weeks - Months
Critical II	One death and/or several severely injured	Significant loss of equipment or system interruption, requiring weeks to repair	Estimated loss from the incident in the range of $500,000 to $5 million	Prolonged media campaign, serious reputational damage, sustained government involvement Days - Weeks
Moderate III	Severe injuries and/or numerous minor injuries	Some loss of equipment or system interruption, requiring seven or less days to repair	Estimated loss in the range of $ 50,000 to $500,000	Adverse media coverage, reputational damage, government involvement Days
Minor IV	Severe injury and/or multiple minor injuries	Some loss of equipment, no system interruption, less than 24 hours to repair	Estimated losses are relatively minor, in the range of $1,000 to $49,999	Local media coverage and some reputational damage Day
Insignificant V	Minor injuries or No injuries	Minor damage to equipment no system interruption, no immediate repair necessary	Estimated loss from the incident are likely less than $1,000	No adverse media coverage or reputational damage

E.3.2 Probability

The probability that a hazard will occur during the planned life expectancy of the system element, sub-system or component is described qualitatively, in potential occurrences per unit of time, events, population, items, or activity. A qualitative hazard probability is derived from research, analysis, and evaluation of safety data from the operating experience of TriMet or historical safety data from similar systems.

E.3.2.1 Hazard Probability Rating System

Probability Level	Specific Individual Item	Fleet or Inventory	Frequency
Frequent	Likely to occur frequently in the life of an item.	Continuously experienced.	>36/yea (Weekly)
Probable	Will occur often in the life of an item.	Will occur regularly.	>12 to <36/year (1-3 per Month)
Likely	Will occur several times in the life of an item	Will occur several times.	>1 to <11/year
Occasional	Likely to occur some times in the life of an item.	Will occur a few times	> .1 to <1/year
Remote	Unlikely but possible to occur in the life of an item.	Possible to occur in the life of the system	>.0001 to <.1/year
Improbable	So unlikely, it can be assumed occurrence may not be experienced.	It can be assumed it will not occur	<.0001/yr

E.3.3 Hazard Risk Index

Together, the hazard severity and probability properties measure a hazard's magnitude and priority for applying the control measures. Hazards are then examined, qualified, addressed, and resolved based on the severity of a potential outcome and the likelihood that such an outcome will occur. The value derived by considering a hazard's severity and probability is the Hazard Risk Index. The resulting risk index is a measure of the acceptability or undesirability of the hazard and is applied to the Risk Assessment Index.

Assignment of a Hazard Risk Index enables TriMet management to properly understand the amount of risk involved by accepting the hazard relative to what it would cost (schedule, dollars, operations, etc.) to reduce the hazard to an acceptable level.

The following matrix identifies the Hazard Risk Index based upon hazard category and probability and the criteria for defining further action based upon that index.

E.3.3.1 Hazard Risk Index Rating System

HAZARD RISK INDEX					
Frequency of Occurrence	Severity Category				
	1 Catastrophic	2 Critical	3 Moderate	4 Minor	5 Minimal
(A) Frequent	1A	2A	3A	4A	5A
(B) Probable	1B	2B	3B	4B	5B
(C) Likely	IC	2C	3C	4C	5C
(D) Occasional	1D	2D	3D	4D	5D
(E) Remote	1E	2E	3E	4E	5E
(F) Improbable	1F	2F	3F	4F	5F

Hazard Risk Index	Risk Decision Criteria
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable (Un)
1D, 2C, 2D, 3B, 3C, 4A, 4B	Undesirable (Ud) Executive Management review required
1E, 1F, 2E, 2F, 3D, 3E, 4C, 4D, 5B, 5C	Acceptable with TCRC review (Ar)
3F, 4E, 4F, 5C, 5D, 5E, 5F	Acceptable without further review (Ac)

E.4 Risk Resolution

TCRC and the TriMet Safety Committees are the principal bodies for assessing and resolving identified hazards within the TriMet operating system. However, safety risks related to capital projects (such as rail extensions, equipment procurements and system renovations and upgrades) are reviewed and resolved by the Safety and Security Committee specifically created for the specific capital project.

If a formal assessment is conducted by TCRC, the Hazard Risk Index is used to assist the decision-making process in determining whether a safety risk should be eliminated, controlled, or accepted. If the potential for an accident/incident reveals a Category 1 (catastrophic) occurrence with a Level A (frequent) probability, the system safety effort is directed toward eliminating the hazard through design or at the very least to implement redundant hazard control measures. A catastrophic (Category 1) or critical (Category 2) safety risk may be tolerable if it can be demonstrated that its occurrence is highly improbable. A probable or Level B safety risk may be tolerated if it can be demonstrated that the result of the occurrence would be minor (Category 4) or minimal (Category 5). This provides a basis for logical management decision-making, considering hazard's severity and probability.

As safety risks are identified whether formally or informally, there is an order of precedence in the hazard control process. Various means are employed to reduce the risk to an acceptable level, including:

- Elimination or minimization of the hazard.
- Use of administrative controls.
- Use of personal protective equipment.

E.4.1 Elimination or Minimization of the Hazard

Design for Minimum Risk – If possible, the hazard will be eliminated through a design change. If an identified hazard cannot be eliminated, the hazard will be reduced to an acceptable level, as defined by the Risk Assessment Criteria, through design selection.

Incorporate Safety Devices – If identified hazards cannot be eliminated or their associated risk adequately reduced through design selection, that risk is reduced to an acceptable level through the use of fixed, automatic, or other protective safety design features or devices.

Provide Warning Devices -- When neither design nor safety devices can effectively eliminate identified hazards or adequately reduce associated risk, warning devices are used to detect the condition and to produce a timely warning signal to alert personnel of the hazard. Warning signals and their application are designed to minimize the probability of incorrect personnel reaction to the signals and are standardized within like types of systems.

E.4.2 Use of Administrative Controls

Develop Procedures and Training – Where it is impractical to eliminate hazards through design selection or adequately reduce the associated risk with safety and warning devices, procedures and training are used. However, without specific direction from TriMet Executive Management, no warning, caution or other form of written advisory may be used as the only risk reduction method for Category 1 or 2 hazards. Procedures may include the use of personal protective equipment. Tasks and activities that are determined to be critical require certification of personnel proficiency.

E.4.3 Use of Personal Protective Equipment

If the hazard cannot be eliminated or adequately controlled with administrative controls, personal protective equipment may be needed. Training on the proper use of the equipment is required prior to employees being placed in an environment requiring such equipment.

E.5 Tracking

TCRC and the TriMet Safety Committees track identified hazards—rail transit, bus transit, and occupational health and safety issues, respectively—within the TriMet transit system to final resolution. TCRC is also charged with reviewing and evaluating data from ACID. Hazards related to capital projects, such as rail extensions, equipment procurements and system renovations and upgrades, are tracked through the safety committee created for the project. The Safety and Security Committee tracks hazards identified in PHAs, design reviews, and safety and security certifications. TCRC, the TriMet Safety Committees, and Capital Projects Task Forces maintain logs through the Safety Management Information System (SMIS) that detail resolution activities to date and the current status of the hazard—open or closed. Additional information about safety committees can be found in Appendix B.

The Executive Management Team is advised of Categories I and II hazards that cannot be satisfactorily resolved by the Committees or Capital Projects Task Forces to an acceptable level for final resolution.

E.6 Hazardous Condition Notification to ODOT

TriMet notifies ODOT of hazardous conditions and incidents that meet the criteria listed in Section F – Accident/Incident Notification, Investigation and Reporting and of the following safety and security incidents:

Close calls involving:

- Employees or contractors working in the TriMet right-of-way;
- Near-miss collisions between TriMet revenue and TriMet non-revenue vehicles; and
- Industrial incidents with the potential for fatal or serious injury.
- Rule violations that may result in a catastrophic or serious mishap, including but not limited to:
- Switch run-throughs;
- Operating through damaged or broken switches;
- Doors opened on incorrect side at platform;
- Failure to comply with flagging or work zone restrictions;
- Train order violations that may have a safety impact;
- Unauthorized train movement near or through work zone;
- Unauthorized and/or unprotected equipment or materials that fouls or obstructs train movements on an adjacent track;
- Train speed violations;
- Track right violations;
- Signal violations; and
- Radio violations that may have a safety impact.

Malfunction or failure of safety-critical systems that could result in a catastrophic or serious mishap, including but not limited to the following:

- Tracks;
- Broken rail;
- Track buckle or thermal misalignment;
- Placement of speed restriction;
- Train control system;
- Wrong side signaling failure (false proceed);
- Grade crossing warning system activation failure, partial activation or false activation;
- Local or system wide malfunction of the sign system or system component;
- Traction power system;
- Substation;
- Overhead contact system;
- Failure of insulators and/or contactors;
- Failure of system components resulting in electrical arcing; burning, or smoke;

- Downed or loose live wires;
- Light rail vehicle conditions;
- Broken wheels or tires;
- Broken axles;
- Loose or hanging components at may cause a train to derail;
- Braking failures;
- Doors off hinges;
- Doors remaining open during train movement;
- Arcing electrical components;
- Occurring at passenger and non-revenue facilities
- Any other hazards as determined by ODOT resulting from inspections, investigations, audits or other reviews or observations that ODOT determines to be a safety issue.

Incidents meeting the above thresholds are reported to ODOT within 24 hours of the incident.

E.7 Coordination with ODOT

ODOT is kept informed of safety risk and events that may affect the safety of customers, employees, and property and equipment within the TriMet light rail transit system. In addition to ODOT attending TCRC meetings, ODOT has direct access to the SIMS Hazard and Corrective Action Logs. The logs are sent to ODOT for review and approval.

F. ACCIDENT/INCIDENT NOTIFICATION, INVESTIGATION AND REPORTING

F.1 External Notifications and Thresholds

All external notifications of significant transit incidents are initiated by the TriMet Operations Command Center via e-mail to sso@odot.state.or.us in accordance with the reporting thresholds listed below. The SSES Executive Director (or designee) is the TriMet primary point-of-contact with all external agencies in the event an investigation is initiated by any of the external agencies and for providing updates and additional information, as necessitated by the event. All initial notifications will include the following information:

- Brief description of the incident;
- Internal control number assigned to the incident
- Casualties – number of fatalities and/or injuries; and
- Date, time and location of the incident.

F.1.1 ODOT

ODOT is the designated state rail safety oversight agency for the State of Oregon. As such, TriMet will notify ODOT of any rail-related incident that meets any of the following event criteria. All notifications are made immediately by email or telephone. Security reporting thresholds are found in the TriMet Security Management Plan.

- A fatality, either at the scene or where an individual is confirmed dead within 30 days of a rail-related incident;
- Serious injury to a person or injuries requiring immediate medical attention away from the scene;
- Property damage to rail transit vehicles, non-rail transit vehicles, other rail transit property or facilities, and non-transit property that equals or exceeds $25,000;
- An evacuation due to life safety issue or security reasons;
- Any derailment involving a rail transit vehicle, at any location, at any time, whatever the cause;
- A collision between a rail transit vehicle and another rail transit vehicle or between a rail transit vehicle and non-revenue vehicle;
- A collision at a rail-grade crossing;
- A collision with an individual on the rail right of way;
- Anytime the FRA is notified of an accident as defined by 49 CFR 225.5.

Depending on the significance of the event, a follow-up telephone call may be made to ODOT to ensure the on-duty representative has received the necessary information.

Within 24-hours after the occurrence of a reported incident, employee injury or rule violation, a status report of the event is submitted to ODOT and contains the following information:

a) Identification numbers of employees involved in the event;
b) Hours of service records for the involved employees covering a period no less than 72 hours prior to the incident;
c) Number of injuries and fatalities resulting from the event;
d) Probable causal and contributing factors, if determined or suspected;
e) If the probable cause has not been determined, an update on the status of the ongoing investigation in the causal and contributing factors;

f) Any additional information obtained or determined, including employee and supervisor reports, applicable train orders, special instructions, operating conditions, and description of equipment involved.

F.1.2 National Transportation Safety Board (NTSB)

TriMet will notify the NTSB, through the National Response Center (800-424-0201) within 2 hours of an incident involving:

- A passenger or employee fatality;
- Serious injury to two or more crew members or passengers requiring admission to a hospital;
- The evacuation of a passenger train; or
- A fatality at a grade crossing.

THE NTSB WILL BE NOTIFIED WITHIN 4 HOURS OF INCIDENTS INVOLVING:

- Damage estimated at $150,000 or more in repairs (or current replacement costs) to the railroad or non-railroad property
- Damage of $25,000 or more to a passenger train including railroad and non-railroad property

NTSB investigations of TriMet incidents are coordinated by the SSES Executive Director. CAPs that may result from the investigation are entered into the SIMS for tracking to closure.

F.1.3 FTA

TriMet will notify the FTA within two hours, at CMC-01@dot.gov or (202) 366-1863, any event involving:

- A fatality occurring at the scene or within 30 days following the incident;
- Collisions between a rail transit vehicle and another rail transit vehicle;
- All collisions resulting in substantial property damage, serious injury, or fatality;
- Runaway train;
- Evacuation for life safety reason due to fire, presence of smoke or noxious fumes, fuel leak, electrical hazard, bomb threat, suspicious item, or other hazard that constitute a real or potential danger to any person;
- Derailment of a rail transit vehicle at any location, at any time, whatever the cause;
- Anytime the FRA is notified of an accident as defined by 49 CFR 225.5;
- Serious injuries
    - Requiring hospitalization for more than 48 hours, commencing within seven days from the date of injury was received;
    - Fractures of any bone (except simply fractures of fingers, toes, and nose);
    - Causes severe hemorrhages, nerve, muscle, or tendon damage;
    - Involves any internal organ; or
    - Involves second-or-third degree burns, or any burns affecting more than five percent of the body surface.

This requirement excludes serious injuries resulting from illness or other natural causes and criminal assaults that are not related to collisions with rail transit vehicles.

FTA will be provided with the following information:

- Brief description of the incident;
- Internal control number assigned to the incident
- Casualties – number of fatalities and/or injuries; and
- Date, time and location of the incident.

All investigations led by FTA are coordinated by the SSES Executive Director. CAPs that may result from the investigation are entered into the SIMS for tracking to closure.

F.2 Internal Notifications

TriMet management, including the SSES Executive Director and Director, SMSES are notified of any event resulting in injury to passengers or employees, damage to TriMet property, damage to non-TriMet property due to transit operations, disruption of transit services, or any other significant event. All notifications are made via text messaging pager. Paging lists are maintained by the OCC and updated frequently.

F.3 Accident Investigation Process

TriMet Field Operations initiates investigations of all transportation related incidents. The level of investigation required is dependent on the seriousness of the event. Rail incident investigation procedures are found in Standard Operating Procedure (SOP) 576.

Incidents, which do not involve serious injury and/or significant damage usually, require only an investigation by the Field Supervisor responding to the scene. The Supervisor at the scene will:

- Perform an investigation;
- Conduct interviews of TriMet personnel involved and of other persons, as appropriate;
- Gather and collect physical evidence;
- Photograph the scene, as appropriate; and
- Submit a report based on the information collected.

Any member of TCRC may activate an incident investigation team to conduct an in-depth investigation and analysis of an incident. (See SOP 217, “Urgent Review of Major Safety or Security Incidents.”) The team, led by SSES, is comprised of representatives from Field Operations, Transportation, Maintenance, and Maintenance of Way (rail related incidents only). Generally, the team is activated to investigate incidents considered serious in nature; however, severity of personal injury and extent of damage are not the sole criteria. All potential Category 1 or 2 hazardous conditions and incidents are investigated, as well.

When activated, the incident investigation team, led by the SSES representative:

- Conducts an on-site inspection of the incident scene;
- Reviews reports written by involved personnel;
- Conducts interviews with involved personnel and witnesses, as necessary;
- Reviews physical evidence;
- Performs system tests, if applicable; and
- Coordinates mishap reconstruction activities, if applicable.

Details of investigation activities, findings, causal and contributing factors and recommendations follows these investigations and are reported to TCRC and are recorded in the minutes of TCRC. All information gathered is retained by SSES.

In addition to the investigation, the Bus or Rail Accident Review Committees reviews rail and bus collisions for preventability. Details are included in Appendix B.

F.4 Corrective Action

The SSES reviews all ACID accident reports for potentially serious incidents or conditions. Additionally, when ACID reports and statistics show repetitive trends that result in an inability to meet or exceed the safety goal and objective, the SSES may initiate an investigation to determine causal factors. The SSES coordinates with appropriate departments, to determine the required corrective actions. Corrective actions will be developed and entered in TCRC minutes and the Safety Information Management System (SIMS) database and will serve as the CAP.

The plan includes a description of the findings, the planned corrective actions (recommendations), target completion date, actual completion date, and person responsible for completing the corrective action. When a corrective action is **COMPLETED AND** documentation is submitted to demonstrate completion, the information will be presented to TCRC and is entered into the SIMS database. The documentation is submitted to ODOT for review and final approval.

Any incident of concern may be brought to TCRC. Corrective actions, if any, are tracked to completion through TCRC and the SIMS database, which serves as the CAP. The log includes a description of the concern, corrective action, the date of evaluation, the persons(s) responsible for action, the hazard resolution matrix evaluation, the approval date and the closing date. The log is reviewed and updated monthly at the TCRC meetings and items are tracked until completed.

All rail incident CAPs are submitted to ODOT for review and approval.

Additionally, ODOT, FTA, and the NTSB may issue CAPS to TriMet. The CAPS will be entered into the SIMS for tracking, through closure.

F.5 Reporting and Coordination with ODOT

A monthly summary report is submitted to ODOT of all incidents, which meet the reporting criteria, within 30 days from the last day of the month covered. When a reportable incident or condition involves post-accident inspections, examination, or testing, ODOT is notified so that they may participate in the investigation. ODOT may, at any time, elect to conduct a separate, independent investigation. However, ODOT has given TriMet authority to conduct investigations on their behalf. The final investigation reports must be submitted to ODOT for review and approval.

An annual report of TriMet safety performance is submitted to ODOT each February.

G. AUDIT PROCESS

G.1 Internal Safety Audits

The purpose of internal system safety audits is to inform management if programs and activities are meeting planned and published system safety program requirements. Audits are authorized by TriMet senior management to verify program compliance with requirements and policy. The process, maintained by the SSES, is outlined in the Internal Safety Audit Process (ISAP) document, which is available on TriNet, TriMet's intranet.

TriMet Safety staff or a designated Contractor conducts system safety audits as random or scheduled events.

The Safety Management Systems and Environmental Services ((SMSES) Director is responsible for the audits to determine if TriMet's departments are performing specified safety functions. Each audit area is reviewed at least once every 3 years. An audit schedule is prepared for the 3- year cycle by the SMSES Director. It is TriMet's intent to audit approximately one-third (1/3) of the audit areas each year. ODOT is notified of these audits 30 days in advance and may elect to attend. Additionally, copies of checklists and procedures used for internal reviews are submitted to ODOT at the time of the notification. Audits that cannot be conducted by the SSES due to conflict of interest are performed by the Internal Audit department or a consultant.

The SMSES ensures that all audits are performed on a coordinated basis with the support of TriMet management. Once the scope and audit date are established, the involved department or unit are required to provide full cooperation to the auditors. Any portion of the audit may be repeated during the cycle.

The following areas are included in the schedule of audits:

- Policy Statement and Authority for SSPP
- Goals and Objectives
- Overview of Management Structure
- SSPP Control and Update
- SSPP Implementation Activities and Responsibilities
- Hazard Management Process
- System Modification
- Safety and Security Certification
- Safety Data Collection and Analysis
- Accident Investigation
- Emergency Management Program
- Internal Safety Audits
- Rules Compliance
- Facilities and Equipment Inspections
- Maintenance Audits and Inspections
- Training and Certification for Employees and Contractors
- Configuration Management and Controls

- Local, State, and Federal Requirements
    - Hazardous Materials Programs
    - Drug and Alcohol Abuse Programs
- Procurement Process
- Hours of Service

Both announced and unannounced audits may be performed. Announced audits are scheduled to minimize disruption of activities. Unannounced audits may be performed where only the SMSES and the audit team are informed.

Auditing teams may utilize checklists approved by the SMSES Director and the Director and/or Manager of the department or unit being audited. The audited department/unit is given the opportunity to provide support documentation to the auditors to "close" the items on the checklist. Confidential documentation, unless approved by the General Manager, is not part of the audit.

All audits are fully documented. A draft report is submitted to the responsible department/unit for review and comment. If there is no disagreement with the audit findings and recommendations, the auditing team will then submit a final report, along with the checklist, to the SMSES Director. The SMSES Director will submit a final audit report to the manager, director, and executive director of the department audited; the Chief Operations Officer; and to ODOT. TCRC is also informed of the audit and findings during the monthly meetings.

Audit reports include:

- Elements and activities of the SSPP audited;
- Name(s) of the auditor(s);
- Audit date(s);
- Checklists and procedures used;
- Summary of findings, including open items and problem areas;
- Required corrective actions, if any.

A CAP is developed by the department/unit audited, with concurrence from the SSES. The SSES tracks all corrective actions to resolution using a tracking matrix. The matrix includes: item description, requirement, comments, target completion date, actual completion date and the party responsible for completion. The responsible party signs the tracking sheet when a finding is closed.

At the conclusion of the annual audit cycle, TriMet will prepare an annual audit report for submission to ODOT. The report will detail the number of audits conducted for the year, progress made in reviewing each of the audit areas during the 3-year cycle, and the status of all internal review findings and corrective actions. The annual report will be transmitted to ODOT under the signature of the TriMet's Accountable Executive, affirming that TriMet is in compliance with its system safety program plan. If the internal audits should find areas of non-compliance with the SSPP, the transmittal letter will indicate those actions taken to reach compliance.

G.2 External Agency Audits

Periodic audits are conducted by the FTA and/or ODOT. Following each audit, a CAP is developed with the managers and directors who will provide documentation to resolve each findings and observations. All findings and observations from these audits are tracked to completion by the SSES as part of the CAP. Once an item is completed, the manager or director or their delegate must sign, indicating that the item is complete and that proper paperwork has been submitted. The documentation is then submitted to ODOT for review, approval and final signature.

In addition, the SSPP is reviewed annually by ODOT. Any deficiencies are resolved before ODOT approves the document.

H. FACILITY AND EQUIPMENT INSPECTIONS

Facility and equipment inspections must be effective in order to identify potential failures or degradation of operational safety early on. Inspection and maintenance of facilities and related equipment are performed in accordance with the manufacturers' manuals, codes, standards, and established procedures. The goal is to maintain a level of readiness that ensures safe, efficient and reliable transit service. Preventive maintenance activities on wayside equipment and other safety critical equipment are performed in accordance with the manufacturers' recommended practice and documented.

Quarterly facility inspections are conducted at each maintenance facility to detect and eliminate hazards. The inspections are conducted by the SSES with the assistance of maintenance staff and safety committee members. Each facility is visually inspected for compliance with OSHA and Fire Codes. Findings are assigned to the responsible party for resolution. Any findings from the inspection are verified and tracked to completion by the appropriate safety committee.

Signals shacks and traction power substations are inspected monthly by qualified technicians. This information is tracked in TriMet's Maintenance Management Information System (MMIS) database. Any defects are corrected immediately or scheduled for correction. MMIS records remain open until corrective actions are completed.

Annual safety inspections are made of administration buildings and break rooms to detect and eliminate hazards to ensure the safety of passengers and employees using TriMet facilities. Any findings are assigned to appropriate parties and tracked to completions by SSES.

In addition, each TriMet facility is inspected by the Fire Department, annually. Any findings are corrected by Facilities and tracked by SSES.

Deficiencies noted during inspections are documented and retained by the SSES. These deficiency reports are sent to applicable managers and responses are tracked by SSES and/or the Safety Committees until completed.

For operations on the TriMet system, inspection and maintenance must be effective to assure that all systems, equipment, and facilities operate as required, or in the event of failure or degradation of functionality, that operational safety is not compromised. This aspect of inspection and maintenance directly pertains to the safety of TriMet customers, emergency response agencies, the general public, and employees and subcontractors of TriMet.

The Maintenance of Way department conducts visual inspection of the alignment and records any defects in MMIS. Defects may be corrected immediately, or scheduled. MMIS records remain open until corrective actions are completed.

The Maintenance Department maintains databases to track scheduled inspection and maintenance of vehicles and equipment. An active log is maintained by Rail Equipment Maintenance of all in-service failures recorded in ACID. Although such failures may not necessarily lead to an incident or accident, all "in service" failures are documented for review and for determination of the causal factors. Corrective action of "in service" failures are coordinated with the various Rail Operations departments and the SSES, as appropriate.

Safety critical equipment that does not meet established requirements is required to be withheld from service. Vehicles or equipment involved in an accident are inspected by qualified personnel prior it to being placed back into service.

Inspection of rail systems, buses, light rail vehicles, and facilities are made in accordance with appropriate maintenance manuals and procedures. The SSES monitors accident reports and audits maintenance records to ensure equipment and facilities are maintained at an optimum level of safety. Documentation that may be audited includes ACID reports and MMIS records. MMIS is the primary recordkeeping system used to store maintenance records. Findings from audits are tracked to completion on a CAP in the SMIS.

I. MAINTENANCE AUDIT AND INSPECTION PROGRAM

Inspection and maintenance of TriMet operating systems must be effective to assure that all revenue and non-revenue vehicles, wayside systems, and equipment operate as required, or in the event of failure or degradation of functionality, that operational safety is not compromised. This aspect of inspection and maintenance directly pertains to the safety of TriMet customers, emergency response agencies, the general public, and employees and subcontractors of TriMet.

Implementation of inspection and maintenance activities is under the direction of MOW for fixed plant equipment, track, signals, communications, overhead contact system, and other wayside equipment, and the Rail Equipment Maintenance Department for LRVs, non-revenue vehicles, and other support equipment. These departments closely coordinate their actions with Rail Transportation and the SSES.

Inspection and maintenance of all vehicles, equipment, and wayside systems are performed in accordance with manufacturers' manuals, codes, standards and established procedures. The goal is to maintain a level of readiness that ensures safe, efficient and reliable transit service. Preventive maintenance activities on LRVs, vehicles, wayside equipment, and other safety critical equipment are performed in accordance with manufacturers' recommended practice and are documented.

Maintenance of Way, Bus Maintenance and the Rail Equipment Maintenance Departments maintain a database, called MMIS, to track scheduled inspection and maintenance of vehicles and equipment. Preventative Maintenance (PM) is done by checklist, with defect either fixed immediately, or entered into the MMIS system to be tracked to completion. The MMIS system can be searched by vehicle or defect to ensure that items are not overlooked in the system. As PMs are due, MMIS is searched for any defects on the vehicle; PMs for buses and trains are based on mileage, which is checked twice per week.

In addition, Maintenance of Way and Bus Maintenance use a "pending work" list, which is a part of MMIS. This is used for items that cannot be immediately repaired. These lists are reviewed by the Supervisors to ensure completion of all work.

An active log is maintained by Rail Equipment Maintenance of all in-service failures on rail equipment recorded in ACID. Although such failures may not necessarily lead to an incident or accident, all "in service" failures are documented for review and for determination of the causal factors. Corrective action of "in service" failures are coordinated with the various rail operations departments and SSES, as appropriate.

Safety critical equipment that does not meet established requirements is required to be withheld from service. Vehicles or equipment that are involved in an accident are inspected by qualified personnel prior it to being placed back into service.

TriMet's Internal Audit Department provides independent assessments of maintenance and inspection programs. Deficiencies identified by the Internal Audit Department are reported to management and the deficiencies are tracked to completion.

J. RULES AND PROCEDURES DEVELOPMENT, MAINTENANCE, AND COMPLIANCE

J.1 Rules and Procedures

Policies, rules, and procedures are reviewed annually to ensure they provide for the safe operation of the bus and rail systems in normal and emergency conditions and to ensure compliance with appropriate governing bodies. Additions to or deletions from these documents, which impact the safe operation of the system, are coordinated through the TCRC and other affected departments for approval prior to implementation.

These documents include:

- Rail Operations Rule Book
- Bus Operator Standard Operating Procedures
- Rail Operating Procedures
- Maintenance of Way Procedures
- Rail Equipment Maintenance Procedures

J.2 Operational Training and Re-Certification

J.2.1 Initial Training

All safety-sensitive bus and rail transportation and maintenance personnel are initially instructed on the operational and safety rules and procedures and are provided with Standard Operating Procedures and Rulebooks, as appropriate for the function.

J.2.2 Re-Certification

All Bus Operators received recurrent training annually by qualified Bus Trainers. The training process includes performance testing. Bus Operators may be given supplemental training, based on accidents, or reported behaviors.

All Rail Operators, Supervisors, and Controllers are required to re-qualify annually. The process includes review of safety critical rules and procedures, particularly those that have a frequency of violation; new procedures or rules; written knowledge testing, and performance testing. In addition, training is given to each Operator, Supervisor, and Controller each time a new section is added to the alignment.
Re-qualification may be required any time an Operator, Supervisor, or Controller performance record indicates a deficiency.

The training department retains all training documents and evaluations. Records of accidents and rule violations are entered into and maintained on the ACID system as they occur. They are reviewed by the Manager of Rail Transportation for rail operators and Manager of Field Operations for Supervisors and Controllers. The Managers will address any issues with the transportation personnel and work to correct any problems.

J.3 Rail Operational Safety Compliance

The Rail Operational Safety Checks Program serves as the foundation for observing, correcting, and documenting safety related behaviors and activities. The Program is also used to reinforce positive safety behaviors.

Rail Field Supervisors and Rail Training Supervisors are principally responsible for conducting periodic field and on-board rail operations safety checks. However, safety staff also perform periodic safety observations. Rail Training Supervisors travel along the rail alignment or board trains to observe and evaluate adherence to rules, policies and procedures, as well as verbal or written instructions such as train orders and special instructions. An operation safety check is made of each operator, at least annually. Rail operator safety checks are recorded on "Check Ride Forms" (T-129 and T-130) and entered into ACID, with a hardcopy to the managers for follow-up, as needed. Rail operators are observed for fitness-for-duty at this time, as well. Additionally, rail field Supervisors observe rail operations and worksites to ensure compliance with rules, procedures, work permits, operations, orders, special instructions or train orders. Supervisors advise OCC that flags or flagging arrangements need to be altered, train orders/special instructions amended or cancelled, or that work needs to be suspended. All rail operations/worksite observations are documented on the Supervisor report form. Both rail field and Training Supervisors are authorized to take appropriate and immediate actions if indicated by the situation. The results of the field/on-board operational safety checks activity are forwarded to the Rail Transportation and Training managers for review and follow-up for appropriate action.

In addition to the field and on-board observational checks, violations of red signal aspects in signalized territory and over-speed trips are automatically recorded and transmitted to OCC. The Rail Field Supervisor assigned to the area in which the violation took place is immediately notified to investigate the situation. Reports of the violation are submitted to the rail transportation and training managers for review and follow-up and recorded in ACID. As warranted by circumstances, on-board LRV event recorders may also be examined to verify operational compliance.

Rule violations that may have a safety impact are monitored by SSES, and communicated to ODOT by SSES as appropriate.

The results of the analysis are used to revise training and safety programs, as warranted, and safety risk assessments.

J.4 Accident Reviews

Each Bus and Rail Accident involving property damage or injury, regardless of severity, is reviewed by an Accident Reviews Committee. The Committee consists of two Trainers and two Operators who are voting members. The SMSES Director or delegate chairs the committee and votes in the event of a tie. An ATU Executive Board Representative is present at all committee meetings. All accidents are judged on "preventability" as defined by the National Safety Council. The results of the judgments are sent to the managers for follow up action as appropriate. Any safety concerns that are noted are given to Bus or Rail trainers attending the meeting and the respective Safety Committee for resolution.

K. TRAINING AND CERTIFICATION PROGRAM

The SSES provides safety training to employees. Employees exposed to chemicals and/or overexposed to physical agents receive training in hazard communication, use and care of personal protective equipment, and hazards and safe handling methods of chemicals. Blood borne pathogen training is provided for employees who are required to cleanup body fluids.

In addition, pertinent information is distributed through bulletins, newsletters, and postings to employees about current topics.

SSES coordinates with transportation and maintenance training instructors in formulating and refining training programs.

K.1 Operationally Related Safety Training

Safety training is conducted about TriMet equipment and operating rules and procedures. Copies of SOPs and rules are given to all TriMet operating personnel. SOPs and rules are formulated by the Operations Division and submitted to TCRC for review and approval. Training programs are developed and coordinated by SSES to ensure that the safety message remains forefront and include sound safety practices.

All Rail Operations and Maintenance personnel must pass an annual examination of the safety rules and procedures. Each person who fails the annual examination is given special retraining. The preparation, administration, and maintenance of these examinations and related records are the responsibility of the employee's respective department.

K.2 LRT Operator Training

All new train operators participate in the LRT operator training course. This course covers rules, procedures, and actual train operation. Each new LRT operator is certified with both written and practical testing to validate operational readiness and knowledge of operating and safety rules and procedures. Annually, each operator is given a refresher course on the rules and procedures, and will re-certify with written and practical testing. In addition, training is given when a new extension is opened or when a significant change is made to the functionality of the operating system. All training records are maintained by the Rail Transportation Training Department.

K.3 LRT Field Supervisor and Controller Training

LRT Field Supervisors receive training in LRT operations, rules, standard and emergency operating procedures, incident command and emergency response, accident/incident investigations, customer assistance, and Light Rail Vehicle troubleshooting. Supervisors are certified through both written and practical testing to validate operational readiness and knowledge of the rules and procedures.

Rail Controllers receive training in the areas of train movements; tunnel emergency systems procedures, emergency response management, and coordination of maintenance and construction activity within the LRT right-of-way. Controllers are certified through both written and practical testing to validate knowledge and expertise in responding to a wide range of operating situations and problems.

Bus Dispatchers receive training in emergency procedures and emergency response management. They are certified through both written and practical testing to validate knowledge and expertise in responding to a wide range of operating situations and problems.

Rail Field Supervisors and Controllers receive refresher instruction and are re-certified annually through written and field examination. In addition, Rail Field Supervisors are required to do a monthly certification trip. Controllers and Supervisors attend the annual recertification for Rail Operators. The Field Supervisors retain their Operator certification. All training records are maintained by Field Operations or by Training.

K.4 Rail Maintenance Personnel Training

Rail maintenance requirements, methods and procedures of rail equipment and systems are described in manuals, handbooks, and other documentation developed for the training and certification of maintenance personnel. Use of personal protective equipment (PPE), emergency equipment, and safety instruction are included in the training program. All personnel who work on Light Rail Vehicles (LRVs) are certified journeymen and must complete a state sponsored program. Paperwork is maintained by the State and by the maintenance trainers. Apprentices work under the direct supervision of journeymen mechanics.

Rail maintenance personnel who are required to operate LRVs, hy-rail equipment, heavy equipment, or other specialized vehicles/equipment/apparatus are certified by both written and practical testing in order to document the employee's knowledge of safety and operating procedures and skill in the proper and safe operation and procedures. Each employee will re-certify in the proper and safe use of the following equipment/vehicles with written and practical testing:

- Forklift – recertification training conducted every 3 years
- Hy-rail/Rerail – recertification training conducted annually
- REM LRV operation – recertification training conducted every 3 years
- Rail maintenance personnel who work on energized electrical equipment are trained and certified in lockout/tagout, first aid and CPR/AED. Each applicable employee will re-certify in the following safety training with written and practical testing.
- CPR/AED - recertification training conducted annually
- First Aid - recertification training conducted every 3 years
- Lockout/Tagout – recertification training conducted annually

Required recertification is completed every 3 years or annually, as required, but no later than 30 days from the employee's anniversary training date. The maintenance trainers retain all the paperwork.

K.5 Maintenance of Way Training

Maintenance of Way (MOW) requirements, methods and procedures are described in manuals, handbooks, and other documentation developed for the training and certification of MOW personnel. Use of PPE, emergency equipment, and safety instruction are included in the training program.

MOW includes the following disciplines: substation technicians, overhead technicians, track maintenance, and signals technicians. Each discipline has a training program consisting of both written and practical testing to document the employee's knowledge of safety and

operating procedures and skill in the proper and safe operation and procedures. MOW Training maintains these training records.

K.6 Contractor Training

Contractor personnel who work in the LRT right-of way under live rail traffic are required to attend a TriMet sponsored course in track access and right-of-way flagging and operating procedures. Only qualified personnel are permitted in the LRT right-of-way. Additionally, contractors who may work in TriMet environments with unique or unusual occupational hazards are provided familiarization instruction to ensure they are aware of the hazardous condition and how to protect themselves.

K.7 Compliance Assessment

A variety of methods are used to assess compliance with training and certification requirements.

- Rail Operators are assessed by "Observation Rides". These are conducted by Rail Operations Training Assistants. Prior to the ride, the Training Assistant review the Operators files and looks for documented issues or complaints. Once the ride is completed, any observations or concerns are discussed with the Operator. Follow-up rides are conducted if needed. All of the Training Assistants observation are documented. These are kept electronically by the training department.

- Supervisor's reports are reviewed to assure compliance with training and certification requirements; conversations with the OCC are recorded and may also be reviewed.

- SSES provides oversight to ensure that contractors comply with applicable laws and requirements. Oversight may include a review of work plans, site visits and audits.

- Bus Operators are assessed by "Observation Rides". These are conducted by Training Supervisors. Once the ride is completed, any observations or concerns are discussed with the Operator. All of the Training Supervisors observations are documented. These are kept electronically by the Training department.

- Maintenance of Way employees are assessed by their Supervisors. These "spot checks" are conducted as frequently as deemed necessary. In addition, all reports are entered into an electronic tracking system and are reviewed by management.

- Rail Equipment Maintenance uses Maintenance Supervisor staff for monitoring compliance with established procedures, rules and regulations whether they are TriMet generated, regulation, or industry standards, such as APTA. This is done by reviewing work tickets & related documents (check sheets), direct visual supervision of work practices in the shop and communication relating to individual work performance with training staff, fellow Supervisors, and the Maintenance Manager.

L. EMERGENCY MANAGEMENT PROGRAM

The ability to respond quickly and in an organized manner is vital to the continuation of transit service during a special event, emergency, or during the recovery from a catastrophic incident, including but not limited to:

- Earthquake
- Fire
- Flooding
- Hazardous material spill
- Medical emergency
- Severe weather
- Transit related accidents
- Volcanic activity
- Acts of terrorism

A more extensive discussion of TriMet emergency management activities is contained in the TriMet Emergency Management Plan.

L.1 Incident Management

TriMet management of an emergency event or incident is based on the principles of the National Incident Management System (NIMS) and the Incident Command System (ICS). Using NIMS principles allows emergency response agencies to communicate with Tri-Met Field Supervisors and/or the TriMet OCC. The structure of the ICS can be as simple as a single TriMet Field Supervisor responding to an incident, or may require the activation of a field Incident Command Post (ICP) or the TriMet Emergency Operations Center (EOC). In each case, a TriMet Field Supervisor initially responding to an incident acts as the TriMet Incident Commander (IC), but may be relieved by a more senior, qualified, manager. All TriMet employees responding to the scene report to the TriMet IC so that all participants and their expected actions can be coordinated. When an incident requires response from fire departments, emergency medical services, police, and other emergency services, the TriMet IC becomes the liaison between TriMet and the emergency response agency IC. In a Unified Command Structure, the TriMet IC coordinates closely with the representatives from the outside agencies to help ensure the safety of customers, TriMet and emergency response personnel, and the general public; and to make certain that the appropriate TriMet resources are available at the incident scene.

The TriMet OCC serves as the central management center for all bus and rail incidents. The OCC is staffed 24 hours a day, 7 days a week. The OCC is responsible for:

Implementing the appropriate response plan;
Requesting assistance from outside emergency response agencies for fire, medical, police, and evacuation emergencies;
Dispatching TriMet Field Supervisors to the scene and other designated locations, as required;
Communicating and controlling all bus and train movements, and adjusting service schedules, as required;
Activating the appropriate emergency systems;
Coordinating requests for additional TriMet resources, i.e. equipment and personnel; and

Notifying TriMet management personnel and SSES staff, and external agencies, as appropriate.

When the incident or event requires additional support to Field Operations, the IC will request activation of the TriMet EOC. The TriMet EOC co-located with the OCC. In severe circumstances, the EOC may be located at the Ruby Junction back-up facility or mobile within a semi-truck trailer.

L.2 Emergency Response Planning and Coordination with External Agencies

The TriMet SSES Emergency Management and Security Manager is principally responsible for the coordination of incident management resources with various emergency service agencies to provide for effective interaction between TriMet and the agencies. Liaison with law enforcement agencies is primarily the responsibility of the SSES Executive Director, with assistance from the Emergency Management and Security Manager.

L.2.1 Emergency Response Planning and Mitigation

TriMet establishes a Fire/Life Safety and Security Committee for each new rail extension or significant transit facility. The committee is comprised of SSES staff; TriMet operations, maintenance, and engineering representatives; and police, fire, emergency medical, and other emergency response agency representatives. The committee reviews transit system designs and recommends fire protection, life safety and security measures, and procedural response and training needs related to the new extension or facility.

As a critical transportation provider in the Portland metropolitan area, TriMet is a member of the Regional Disaster Preparedness Organization (RDPO). RDPO is responsible for emergency preparedness, response, recovery, and mitigation planning and coordination among the counties and cities in the metropolitan area, emergency response agencies, TriMet, utility companies, and other critical groups. TriMet's SSES Executive Director and Emergency Management and Security Manager coordinates its emergency response planning activities with RDPO. The RDPO sponsors several projects that impact regional emergency preparedness, response, recovery, and mitigation using Department of Homeland Security (DHS) funds.

L.2.2 Emergency Planning

TriMet, with assistance from the Fire/Life Safety/Security Committee and RDPO, has developed emergency management operating plans and procedures to address a wide range of emergency incidents and events, including criminal activity, earthquakes, fire at transit stations and along the rights-of-way, hazardous materials releases, medical emergencies, severe weather, terrorism, transportation mishaps, and other emergency situations occurring within the TriMet transit system. The procedures are designed to minimize the adverse effects to life, property, and the environment, and to minimize the disruption of transit services.

L.3 Emergency Preparedness Exercises

A minimum of one emergency tabletop or field exercise is planned and conducted annually to ensure the:

- Adequacy of emergency plans and procedures.
- Readiness of TriMet personnel to perform under emergency conditions.

- Effective coordination between TriMet and emergency response agencies.
- Coordination of regional emergency exercises that are facilitated through RDPO.

All exercises are followed by after-action reports to document lessons learned and actions needed to improve TriMet's emergency operations capabilities. TriMet, through its dedicated Manager of Emergency Management and Security, works with TriMet staff and others to resolve all lessons learned.

Full activation of the TriMet EOC, Incident Management Team, and ICS structure provides exercise opportunity at least twice per year during the Rose Festival Starlight Parade and the Grand Floral Parade. TriMet also participates in exercises with other agencies, when requested.

L.4 Training

All front line TriMet transportation and front line maintenance personnel undergo emergency response training to ensure they have a full understanding of their role and responsibility during an emergency incident. The level of training is based on their anticipated role during the incident. At a minimum, training is provided on the emergency plans and procedures that the employee may be required to implement, and on any specialized equipment.

Training to familiarize fire, rescue, and other emergency service personnel with special transit system requirements is coordinated through the SSES with assistance from the Transportation and Maintenance Departments, as appropriate. This includes initial hands-on training regarding rail extensions, new rail vehicles, or transit buses that present unique hazards. Additionally, familiarization tours are held of new transit facilities. Refresher training is coordinated with the various agencies to ensure they remain knowledgeable in the unique hazards that transit operations present including, but not limited to, accessing the rights-of-way, grade crossings protocol for agencies running at code three, and traction power.

L.5 Revision and Distribution

Emergency plans and procedures are periodically reviewed and updated by TriMet's Manager of Emergency Management and Security and other TriMet staff and updated through TCRC to ensure they remain pertinent, and revised, as required through evaluations of exercises and actual incidents. Any proposed revisions are coordinated with the agencies that may be affected by the change and RDPO, prior to implementation.

Procedures are distributed to appropriate staff through their managers.

M. SYSTEM MODIFICATION PROCESS

M.1 Transit Change Review Committee (TCRC)

TCRC was established to review and approve all proposed changes and modifications existing bus and rail systems safety baselines. Any additions, modifications, or deletions to Bus or Rail Operations SOP, and to the existing safety configuration of operating bus or rail system fixed facilities, rolling stock, and equipment directly related to operation of rolling stock, are reviewed and approved by TCRC. These reviews are established to ensure that system and operational changes are approved prior to implementation, and those drawings, manuals, and other related documents, including training programs, are updated to reflect these changes.

Specifically, committee members are responsible for the development and review of proposed changes to:

- Operating Rules;
- SOPs;
- Configuration of bus or rail equipment, bus or rail systems, and facilities, including those affecting the safety of TriMet operations;
- Bus and Light rail vehicles.

TCRC may also recommend changes to bus and light rail training programs, as identified through incident reviews, audits, and other assessments.

Members include the SSES Executive Director (Chair); the Director of Facilities Management; the Bus and Rail Transportation, Maintenance of Way, and Bus and Rail Equipment Maintenance managers; the Field Operations Manager; the System Engineering Manager and the SMSES. All members participate in the evaluation of changes and must reach consensus. Technical experts may attend committee meetings to clarify proposed changes. ODOT, as the designated safety oversight agency, is an ex officio member of TCRC.

Additionally, the TCRC evaluates the effectiveness of the Bus and Rail system safety programs and activities and its implementation through the review of safety audits, major incident or accident investigations, and safety related statistics to reduce the potential for recurrence of similar incidents and negative trends.

Major safety or security incidents include any incident that has potential for significant liability of TriMet, results in significant, sustained, or unusual disruption of transit service, results in death or serious injuries to persons on TriMet premises or vehicles and/or has potential for high public/media interest or controversy.

N. SAFETY DATA ACQUISITION AND ANALYSIS

The SSES is tasked with monitoring the safety performance of TriMet operations. Safety data is collected and reviewed. This data includes injuries to passengers, TriMet personnel, public, potentially hazardous equipment failures, design inadequacies, and rules and procedure violations. Rail safety performance reports are submitted to ODOT, TCRC, and the Accountable Executive on a monthly and annual basis. The report contains injury data regarding passenger, TriMet personnel, and customer/public accidents and incidents.

Information regarding accidents, incidents, hazardous conditions and TriMet operations are obtained from several different reporting mechanisms. These include, but are not limited to: "Report of Occupational Injury/Illness reports, the Operations Command Center, ACID. The information is summarized in the Safety Management Information System database. The data becomes the basis for the safety dashboards that are distributed to the General Manager, Chief Operating Officer, and Transportation and Maintenance Executive Directors, Directors, and Managers.

N.1 Occupational Injury/Illness Report

The employee Supervisors complete an Occupational Injury/Illness Report any time a staff member reports a job-related injury or illness. This standard report is completed online and submitted to the SMIS database. These reports are reviewed daily by a member of the SSES. Issues are discussed at safety committee meetings and with management, as needed. Items requiring review may be placed on the agenda for TCRC. The process is outlined in SOP 052, "Reporting Employee Injuries".

N.2 OCC

The Operations Command Center (OCC) is the information collection center of TriMet. It is composed of two groups: Dispatch and Control. Dispatch monitors and directs bus operations. Control monitors and directs rail operations. All radio communication to the field is made through the OCC. Information concerning day-to-day issues and operation is relayed from the field to the OCC; information meeting predetermined criteria is entered in the ACID database as it is received.

N.3 ACID

This database is used to collect and maintain a wide variety of data at TriMet. Information reported by operators concerning accidents, near misses, rule violations, defects, and property damage is entered into the system. It is also used to store information concerning whether or not employees are drug tested, accident reviews and vehicle maintenance problems.

This information is used to:

Make accident notifications to governing bodies;

- Send accident/incident information to management, via pager or e-mail;
- Send security information to management, via pager;
- Make decisions on accountability for accidents;
- Supply maintenance information to maintenance shift Supervisors;
- Conduct trend analysis;
- Monitor rule and procedure violations.

- Transportation, Maintenance, and Safety & Security Divisions have access to the ACID system and can use the system to access information concerning accidents, incidents, security issues, and rules violations. It can also be used for trend analysis.

O. INTER DEPARTMENTAL/INTERAGENCY COORDINATION

Each level of the District organization, from the Executive Office to individual District personnel is assigned responsibility for assuring TriMet operations provide for the safety of the public and District personnel, in accordance with the SSPP.

O.1 SSES

The General Manager has delegated the authority for the development, implementation, and management of the SSPP to the SSES Executive Director. The SSES Executive Director is responsible for the coordination of the District safety program and initiative efforts to improve the overall safety of transit customers, the public and employees. Specific responsibilities include:

- Develop and update the SSPP;
- Coordinate and implement the SSPP;
- Manage SSES activities;
- Support and coordinate District safety-related programs, activities, and initiatives;
- Support and coordinate District emergency management activities with emergency response agencies impacted by District operations;
- Monitor and evaluate safety related programs and activities at each District organizational level.
- Train and test transportation personnel, both rail and bus Operators and Supervisors and Controllers and Dispatchers in the proper performance of safety-related operating policies, plans, rules, and procedures. Personnel are systematically trained, tested and certified in the proper performance of all safety-related rules and procedures. This applies to both normal and emergency conditions. Employees are provided with copies of safety and emergency rules, procedures, and policies that affect them. Employees must be re-certified on an annual basis.

The SSES Executive Director is supported by the SMSES Director, the Manager of Environmental Services, the Manager of Emergency Management, four Safety Specialists, an Exclusions Coordinator, an Operations Service Coordinator, a Crime Prevention and Data Analysis Coordinator, an Environmental Specialist, two Administrative Specialists, and Drug and Alcohol Program Coordinator and Specialist. Bus and Rail Transportation Training are also part of the SSES.

In addition, where it is determined that unsafe conditions or practices present an unacceptable safety risk, the Safety staff have the authority to order such conditions corrected or practices halted.

O.1.1 Design, Construction, Testing, Operational Start-Up

The SSES performs activities dealing with safety during the design, construction, testing and operational start-up phase. These activities include:

- Review procurement specifications for inclusion of safety requirements;
- Participation in Safety Design Reviews;
- Job Hazard Analysis;
- Audit acceptance test procedures for inclusion and satisfactory completion of tests, which assess compliance with safety requirements;

- Develop and approve project specific certifiable items and manage the safety and security certification program;
- Assist in inspection of new facilities to ensure they meet safety requirements.

O.1.2 Collection, Maintenance, Analysis, and Reporting

The SSES is responsible for the collection, maintenance, analysis, and reporting of safety data, achievements, and problems. The purpose of this activity is to determine the status and trends of safety conditions, and to monitor performance towards the established safety goal and objectives. This activity is accomplished through the conduct of the following steps:

- Define information requirements and sources;
- Collect pertinent data from TriMet departments;
- Monitor safety conditions and performance;
- Analyze safety-related data-system failures, accident statistics, accidents trends, etc.;
- Report safety performance, achievements, and problems to the Accountable Executive, Executive Directors, Directors, and other TriMet managers.

O.2 Safety Responsibilities of Other Departments

Managers and Supervisors in all departments and divisions are responsible for the prevention of accidents, identification of hazards, and resolution of such hazards.

Reports of all accidents/incidents, deficiencies and defects will be maintained in ACID which is available to the SSES for review.

O.2.1 Transportation and Maintenance Divisions

The primary responsibility of the Transportation and Maintenance Divisions is to provide safe, reliable, and efficient bus and rail mass transportation. Its functions include vehicle operations, vehicle maintenance, facilities and equipment maintenance, and service scheduling.

O.2.1.1 Rail Transportation and Rail Maintenance Departments

The Departments of Rail Transportation and Rail Maintenance are assigned the responsibility for the safe operation of light rail vehicles over the rail system and maintenance of the rail system, respectively.

Responsibilities include:

- Preparing and implementing safe operating policies, plans, rules and procedures. Required policies, plans, rules and procedures for safe operation and maintenance are developed by the Rail Transportation Department and Rail Maintenance Department, respectively, and approved by the SSES Executive Director and TCRC. They are revised when needed to reflect current operating conditions.
- Monitor adherence to safety-related operating and maintenance policies, plans, rules and procedures. Personnel, whose safety record requires follow-up, additional training, or discipline, including discharge, are identified through the maintenance of records, which indicate safety violations of rules and procedures.

- Report safety violations to the SMSES Director. Correct any condition, which has caused, or has the potential to cause, injury to persons or damage to property/equipment.
- Train and test maintenance personnel in the proper performance of safety-related operating and maintenance policies, plans, rules, and procedures. Personnel are systematically trained, tested and certified in the proper performance of all safety-related rules and procedures. This applies to both normal and emergency conditions. Employees are provided with copies of safety and emergency rules, procedures, and policies that affect them. Employees must be re-certified on an annual basis.

The Rail Maintenance Department has developed a preventive maintenance schedule for each system hardware element, which is designed to maintain system safety. Reported deficiencies and defects in equipment or facilities are corrected and monitored to assure satisfactory resolution. Only equipment known to be free of safety defects is placed into service.

O.2.1.2 Bus Transportation and Bus Maintenance Departments

The departments of Bus Transportation and Bus Maintenance are assigned the responsibility for the safe operation of buses throughout the urbanized Tri-County area and maintenance of the buses, respectively.

Responsibilities include:

- Preparing and implementing safe operating policies, plans, rules and procedures; develop required policies, plans, rules and procedures for safe operation and maintenance and submit them to the SSES Executive Director and TCRC for approval; revise safe operating policies, plans, rules and procedures when needed to reflect current operating conditions;
- Monitor personnel in the proper performance of safety-related operating and maintenance policies, plans, rules, and procedures for both normal and emergency conditions; provide employees with copies of safety and emergency rules, procedures, and policies that affect them; monitor adherence to safety-related operating and maintenance policies, plans, rules and procedure; identify personnel, whose safety record requires follow-up, additional training, or discipline, including discharge;
- Report safety violations to the SMSES Director;
- Correct any condition, which has caused, or has the potential to cause, injury to persons or damage to property/equipment.

The Bus Maintenance Department has developed a preventative maintenance schedule, which is designed to maintain system safety. Reported deficiencies and defects in equipment and facilities are corrected and monitored to assure satisfactory resolution.

O.2.2 Field Operations/Operation Command Center

The Department of Field Operations is assigned the responsibility for managing the safe operation of light rail vehicles and buses, responding to emergencies and resolving issue which arise during the course of daily operations.

Responsibilities include:

- Prepare and implement safe operating policies, plans, rules and procedures and submit them to the SSES Executive Director and TCRC for approval. Revise safe operating policies, plans, rules and procedures when needed to reflect current operating conditions;
- Monitor adherence to safety-related policies, plans, rules and procedures. Identify personnel, whose safety record requires follow-up, additional training, or discipline, including discharge;
- Report safety violations to the SMSES Director;
- Correct any condition, which has caused, or has the potential to cause, injury to persons or damage to property/equipment.

O.2.3 Capital Projects

Capital Projects Division coordinates with other departments, including the SSES, to emphasize acceptable levels of safety in the engineering design of new equipment, facilities, and construction specifications. The Division monitors and coordinates, with others, warranty work. It provides procedures that ensure vehicles and equipment, with defects or deficiencies are not placed into operation.

Additionally, the Division is responsible for the supervision of contractor activities to ensure adherence to safety rules, procedures, and regulations.

O.2.4 Marketing & Customer Service (Community Relations)

The Marketing and Customer Service Department (Community Relations) provides information regarding TriMet programs, operations, and events. With regard to safety, the department develops and conducts Outreach programs, that is, safety awareness programs and packages. These are provided to local schools, communities, citizen groups, media, and patrons. These programs and packages highlight the risks to safety and the need for safe behavior on or around TriMet equipment and facilities.

In addition, On-Street Customer Service staff (Field Reps, Ride Guides and “Ask Me” volunteers) provides one-on-one safety education to customers using TriMet’s buses and trains. During special events and service disruptions, On-Street Customer Service staff actively encourages customers to behave safely around buses and trains. During winter storms, On-Street Customer Service staff provides winter safety tips to customers, and report potential safety issues (e.g. icy platforms) through the Incident Command System.

The Marketing Department may conducts outreach or participate as inspection team members at the request of the SSES.

O.2.5 Safety Committees

The SSES is represented on a variety of committees to facilitate the identification of hazards, the proper resolution of safety issues, and distribution of safety information. These include:

- TCRC
- Fire/Life Safety/Security Committee
- Bus Transportation and Maintenance Safety Committees
- Rail Transportation and Maintenance Safety Committees
- Safety and Security Committee
- Bus and Rail Accident Review Committees

Additional information on each committee is included in Appendix B.

O.2.6 TriMet's Internal Audit Department

The Internal Audit Department has responsibilities for performing operational and compliance audits within TriMet based on a risk assessment process. However, the Department may perform Drug and Alcohol Program audits of TriMet contractors as well as other audits as requested by the SSES or other TriMet Departments.

O.2.7 Human Resources

The Human Resources Department is responsible for ensuring compliance with FTA drug and alcohol regulations during the hiring process.

O.2.8 Contracts and Procurement

The Contracts and Procurement Department, as part of the hazard management process, works with the SSES when issuing contracts to ensure that contractors are compliant with state and federal regulations and with TriMet requirements. Contractors who may conduct safety sensitive work are identified and the information is shared with the Drug and Alcohol Program Coordinator for further review. For example, as part of the hazard management process, Contracts and Procurement is responsible for verifying that chemicals are not purchased until approved by the SSES.

P. CONFIGURATION MANAGEMENT

The primary purpose of configuration management is to ensure that potential hazards are identified and assessed before making changes to documents, equipment or facilities. Safety critical operational documents, bus and rail fixed facilities, revenue and non-revenue vehicles, and equipment are subject to configuration management and formal document control procedures. They include, but are not limited to, standard operating procedures, emergency operating procedures, safety and operating rules, training materials, drawings, and engineering reference information.

These documents are subject to review or revision as a result of:

- Repeated service failures as indicated on the service log in ACID;
- Incidents or Accidents;
- Major service changes, excluding routine schedule adjustments;
- Line extensions;
- Accumulation of special instructions or notices, which warrant revision to a "parent" document; Proposed design changes to facilities, equipment, or vehicles.

All proposed changes, including deletions, are subject to review and approval by TCRC. Additionally, any member of the TCRC may request a formal review of an operational document, process or procedure at any time. TCRC includes representatives of MOW, Rail Transportation, Rail Equipment Maintenance, Facilities and SSES. These managers and Supervisors inform their staff of all changes.

Effected employees are notified of changes as follows:

- Changes to SOPs are sent to Road/Rail Supervisors, Operator and Controllers via e-mail with a delivery receipt. Bus Operators are notified of SOP changes in a "Training Bulletin" with their paychecks. Minor route changes are included in the Operators pouch. All SOPs are posted on TriNet and readily available to any employee. Changes to Rail Equipment Maintenance procedures are sent by e-mail to maintenance employees. Rail Rule Book updates are printed and given to all Road/Rail Supervisors, Rail Maintenance staff, Maintenance of Way Employees and Rail Operators by their managers and Supervisors.

- Employees receive training for major system changes, such as rail extensions, in training campaigns or in routinely scheduled training classes. Additionally, configuration management requirements are included in all contracts to assure that changes to the design of equipment and facilities, after design reviews, are adequately documented and approved. The configuration management process uses baseline management to ensure that the technical baseline is defined and controlled throughout the contractual phase, and that the end products satisfy the technical and operational requirements derived from the system needs. Selected documentation, such as record drawings, manuals, procedures, and other documents, is formally designated and approved as part of the technical baseline and are initially under the control of the Capital Project Division. Upon completion of each rail extension or phase, all documents related to the operation and maintenance of the segment/phase is turned over to Rail and Bus Operations and Maintenance, as required.

    - Configuration control procedures are audited to assure that changes to facilities, hardware, and operating and support systems are not made

without the review of the new configuration by all departments/offices affected by the proposed change, and to ensure that the modified system meets all approved safety requirements.

Details of the configuration management process are found in the TriMet Configuration Management Plan.

Q. COMPLIANCE WITH LOCAL/STATE/FEDERAL REQUIREMENTS

TriMet is committed to complying with all applicable local, state, and federal regulatory requirements, including the use and disposal of hazardous materials.

Q.1 Occupational Safety and Health Program

TriMet is committed to the safety and health of its employees and contractors who work within the TriMet transit system. Accordingly, TriMet has developed an Occupational Safety and Health Program and Construction Safety Program. The programs emphasize the recognition, evaluation, and control of hazards arising from the occupational and construction project environments.

The Occupational Safety and Health Program is directed toward achieving a safe working environment for employees and minimizing the likelihood of occupational related injuries and illnesses. The program is based on and complies with applicable federal, state, and local safety codes and regulations. Procedures have been established for the control of operating hazards including, but not limited to, chemicals, noise, cut and abrasion injuries, and strain and sprain injuries. On-the-job training of TriMet employees is focused on hazard recognition and promotion of occupational safety and health practices. Attention is given to the need for, and proper use of, personal protective equipment and clothing as required by the work being performed. Routine comprehensive industrial hygiene surveys and industrial safety inspections are conducted to ensure that health and safety hazards in the workplace are identified and controlled.

Employees and Contractors are notified of hazards in and around the right of way through a permitting process and “Track Access” training, which is provided by TriMet Safety. Contractors are notified of the permit requirement during the bid process. Once the bid is awarded, they must request a permit to access the right of way. The permit shows that track access training is required prior to entering the right of way. Safety and Field Operations issue the permits; Safety schedules and conducts the training.

TriMet employees must also use the permit process to access the right of way. The permits contain the limits of their work locations and dates and times of access.

All permits are kept on file in the OCC and on an Outlook calendar. The Maintenance Controller reviews all permits and notifies Rail Operators of all work that is conducted in the right of way. The Operators are notified through Maintenance Orders and Train Orders; both of these are printed and given to the Operators at the beginning of their shift, when they sign in or turned over in the field when an Operator is relieved on the road. Maintenance Orders are used to inform Operators of work close to the right of way and Train Orders are used to inform Operators that work is being conducted close to the right of way and that persons may enter the right of way. In addition, “call boards” may be used; Operators are required to stop at all call boards and call to Control before they select a signal or proceed through an area protected by a call board.

Q.1.1 Industrial Hygiene Program

TriMet conducts regular industrial hygiene surveys, such as air quality, noise levels, hazardous materials, including wastes and environmental issues, to evaluate the degree of employee, customer, or environmental exposure or impact to chemical and physical agents encountered in the work environment, including the offices. The basis for surveys is through the evaluation of work processes and reports of injury and occupational disease. Survey results are used to determine engineering and administrative controls and the need for personal protective equipment. Reports of the industrial hygiene surveys are submitted to all affected department directors, managers and employees.

Q.1.2 Personal Protective Equipment Program (PPE)

Appropriate PPE is provided, and its use required, as determined by the industrial hygiene program or safety assessment. Department Directors, Managers, and Supervisors are responsible for providing the necessary PPE and for enforcing its use.

R. HAZARDOUS MATERIALS PROGRAM

TriMet has established a comprehensive program for the control of hazardous materials used, including the disposal of waste materials.

R.1 Hazardous Communications Program

TriMet's Hazardous Communication Program details the process for purchasing, receiving, and using hazardous materials within the TriMet transit system. The SSES is responsible for reviewing all Safety Data Sheets (SDS) for chemicals and other potentially hazardous materials that are being considered for purchase and forward an approval for field use, including required protective measures. All employees who may use hazardous materials receive training from their Supervisors on the safe use and disposal of the products. Follow-up is conducted on the field use of approved products to ensure safe/proper handling methods are utilized. This program is updated as regulations change and is maintained by SSES.

All SDS for approved hazardous materials are kept on-line and are continuously available to all employees through the Internet.

R.2 Hazardous Waste Management

The Hazardous Waste Management Program is managed through SSES. Hazardous waste management is performed through procedures and inspections to ensure that all TriMet facilities minimize and control the generation of hazardous waste and ensure disposal is in accordance with federal and state of Oregon environmental regulations. Solvent and oil recycling programs are established to maintain the status of "Small Quantity Generator". Hazardous materials storage areas are established for each facility including designated accumulation storage areas. In addition, all employees having responsibility for the control and disposal of hazardous waste are trained to ensure compliance with environmental regulation. Hazardous material emergency response has been developed and implemented to deal with chemical spills.

A Wastewater Abatement Program has also been established to ensure that all TriMet facilities and equipment are controlling the concentration of hazardous materials in process wastewater.

S. DRUG AND ALCOHOL ABUSE PROGRAM

The drug and alcohol program is administered through SSES in compliance with FTA regulations. The program provides for training of supervision in the signs and symptoms of substance abuse; testing of employees and potential employees prior to placement in sensitive safety positions; post-accident testing; reasonable suspicion testing; record-keeping of test results; and an employee drug information program. The Internal Audit Department conducts periodic audits of the process based on their risk assessment process.

Contractors performing safety sensitive functions are required to implement drug and alcohol programs in accordance with the FTA regulations. Periodic audits are conducted to ensure their program remains compliant with FTA regulations and TriMet requirements.

The policy resides with Safety and can be found on TriNet.

T. CONTRACTOR SAFETY COORDINATION

T.1 Construction Safety Program

Construction safety is administered in accordance with TriMet's Construction Safety Program, contract specifications, and applicable federal, such as Occupational Safety and Health Administration (OSHA), state and local safety requirements. Program details are included in the manual entitled, TriMet's Construction Safety Program. The document outlines the minimum requirements for contractors performing work within the TriMet transit system.

The Capital Projects Division approves the contractor's SSPP and supporting documentation, under the advice of the SSES. Audits of the contractors are conducted to assure compliance with federal and state laws, and TriMet's requirements.

The Safety staff reviews and approves all contractor safety plans for minor projects.

All personnel that work in proximity to the rail alignment are also required to attend Track Access Training. This training is provided by the SSES and Capital Projects.

U. PROCUREMENT

Procurement of new systems such as facilities, equipment, buses, and light rail vehicles include safety requirements in specifications, design reviews, testing and configuration control. These procurements include consultation with the SSES to ensure basic system safety principles.

Consideration is given to the following safety requirements:

- Compatible with the existing TriMet system safety features, design, and procedures.
- Incorporate "fail-safe" principles when failures would cause a catastrophe resulting in injury to personnel, damage to equipment, or inadvertent operation of critical systems.
- Avoid, eliminate, or reduce identified safety hazards by design change, safety devices, and parts or materials selection. Composition of hydraulic fluids, lubricants, and other materials shall provide optimum safety characteristics and fire resistant properties.
- Location of equipment components so that access by personnel during operation, maintenance, repair, or adjustment activities shall not require exposure to hazards such as electrical shocks, burns, cutting edges, sharp points or dangerous or toxic materials.
- Design to minimize severe damage to equipment or injury to personnel in the event of an accident.
- Avoid undue exposure to physiological and psychological stresses, which might cause errors leading to an accident.
- Provide suitable warning and cautionary notes in instruction for operation, assembly, maintenance and repair, and distinctive markings for personnel protection on hazardous components, equipment, and facilities.

Contractors who provide systems, sub-systems, or equipment that affect safe transit operations or passenger/employee safety are required to establish and maintain a system safety program in accordance with an approved system safety program plan. The contractor’s approved system safety program plan must define objectives, tasks, procedures, schedules, and data submittals for the safety activities that will be performed by the contractor. The Capital Projects and Facilities Division approve the contractor’s system safety program plans, with concurrence of the SSES.

Additionally, all personal protective equipment to be used by TriMet personnel are reviewed and approved by the SSES in accordance with respiratory, hearing conservation, or other applicable safety standards. Chemicals and other potential hazardous materials being considered for purchase and use are also reviewed and approved by the SSES and Environmental Compliance.

V. SECURITY

The security program for TriMet is described in a Security Management Plan (SMP) filed with FTA, and the DHS, Transportation Security Administration (TSA). The SMP is considered sensitive security information per 49CFR15 and 1520, with distribution controlled to only those with a need-to-know. The SMP complies with ODOT's rail transit guidance (OAR 741-060-0060), and with DHS guidance including the National Response, NIMS, and National Preparedness Goal. For response to terrorism or natural disaster incidents, TriMet Emergency Management Plan is based on partnerships with the Portland region's Regional Emergency Management Group, Urban Area Security Initiative working group, and first-responder organizations of cities and counties throughout TriMet's service area.

For traditional security functions as well as terrorism prevention, TriMet's plans are based upon a formally-adopted policy of awareness, alert observation and reporting by all employees, especially front-line personnel, combined with effective responses by both TriMet Operations Command and first-responder law enforcement and emergency management organizations. TriMet riders are also asked to report suspicious behaviors or packages to employees, or call 9-1-1 in the event of an incident. TriMet's Transit Police Division works in partnership with Police and Sheriff departments throughout TriMet's service area for high responsiveness to calls for police on the transit system, for application of the TriMet Code throughout the TriMet service area, and for effective criminal investigations and prosecutions. In support of security awareness and reporting by transit system employees, TriMet design criteria for new service projects applies crime prevention through environmental design or CPTED principles, and provides Closed Circuit Television (CCTV) and other equipment to enhance security.

W. HOURS OF SERVICE

TriMet has established and implemented an “Hours of Service” policies for Bus and Rail Operators, MOW personnel, and bus and rail equipment maintenance personnel. The policy for rail personnel comply with the requirements of OAR 741-060-0100. Signal Technicians and Controllers hours of service; however, are governed by the Federal Railroad Administration due to the grade crossings shared with the Union Pacific and short line railroads.

The intent of the policies is to assure that operations and maintenance of Tri-Met revenue vehicles are not placed at risk from the possibility of fatigue by employees. The policy applies to safety sensitive positions directly involved with revenue vehicle operation, maintenance, supervision, control and dispatching.

Hours-of-service limitations may be waived under situations of emergencies, as declared by the Executive Director of Operations. During emergencies, hours of service are limited to the maximum extent practical.

X. SAFETY AND SECURITY CERTIFICATION PROCESS

TriMet, as the operator of the light rail transit line, self-certifies that subsequent extensions, new starts and rail phases are operationally ready to enter safe revenue service. A safety and security certification program is developed and implemented for each subsequent operating segment and phase. Information concerning criteria may be found in the program.

X.1 Goals

The goals of the safety and security certification program are to:

- Verify that identified safety requirements have been met;
- Provide evidence that the new operational segments/phases are safe to use in revenue service**.**

X.2 Objectives

Accordingly, the objectives of the safety and security certification program are to document that:

- Facilities and equipment have been constructed, manufactured, inspected, installed, and tested, in accordance with safety requirements in the design criteria and contract documents;
- Operations and maintenance procedures and rules have been developed and implemented to ensure safe operations;
- Training documents have been developed for the training of operating personnel, and emergency response personnel;
- Transportation and maintenance personnel have been trained and qualified/certified;
- Emergency response agency personnel have been prepared to respond to emergency situations in or along the TriMet light rail right of way;
- Safety related system integration tests have been conducted;
- All security related issues have been addressed and resolved as specified in the SMP.
- Emergency management related issues have been addressed and resolved as specified in the EMP.

X.3 Outline of the Certification Process

An outline of the certification process used for new starts or additions to the existing system is shown below. The process begins with system design and continues through the start of revenue operation.

- Identify those safety and security related elements to be certified;
- Establish Safety & Security Design Criteria
- Create Certifiable Items Lists
- Prepare the Specification Conformance Checklist;
- Perform testing and verify conformance;
- Manage Integrated Testing;
- Resolve all open items;
- Approve completed checklist and issue Project Safety & Security Certificate.

The Design Criteria is established by Capital Projects and is based upon codes, requirements and best practices. The Certifiable Items lists and the Specification Conformance Checklists are created and tracked to completion by the Resident Engineer for each project with the assistance of the Safety and Security Committee. Testing is completed by the Resident Engineers and their contractors with oversight by the SSES and the SSC.

An Integrated Test Plan is written by the Resident Engineers and implemented by designated staff with oversight by the SSES and the SSC.

Open items are tracked to completion by the Resident Engineer with the assistance of the SSC; some items may be left open with a mitigation plan which takes effect after the opening of the extension or use of the modification. This must be approved by the SSC.

Each critical system element receives a written safety certificate. Certificates will be issued and signed, at a minimum, by the Resident Engineer and the SSES. When all required system elements are certified, a system-wide safety certificate is issued along with a safety verification report. Final authority to approve certification of extensions for revenue service rests with the Accountable Executive.

The safety and security certification process also applies to major projects to rehabilitate or modify the existing system. These projects would include:

- Purchase of new rail vehicles, including high rail vehicles
- Construction of new facilities
- Modification of existing MOW systems
- Additions and modifications to the platforms and pedestrian crossings

TriMet's SSC Programs are detailed in separate documents, which include project specific requirements.

APPENDIX A: SYSTEM DESCRIPTION

A. INTRODUCTION

The District is responsible for providing safe, reliable, and efficient bus transit and paratransit service in the urbanized areas of Multnomah, Washington, and Clackamas counties, and light rail transit (LRT) service through the cities of Gresham, Portland, Beaverton, Milwaukie, Clackamas County and Hillsboro, Oregon. Service is also provided to the Portland International Airport.

Washington County Commuter Rail provides service between Wilsonville and Beaverton, utilizing existing freight trackway.

This following chapter presents a brief history of light rail system development, a summary of the modes of service, and an overview of TriMet facilities and vehicles.

B. LIGHT RAIL TRANSIT HISTORY

In March of 1982, work began on the construction of a 15-mile light rail system between the Cities of Portland and Gresham. This segment, known as the Banfield alignment, opened in September 1986.

In September 1997, the first segment of an 18-mile extension, known as the Westside Project, opened for revenue service. The project continued light rail transit service from the former terminus in downtown Portland to the west. The opening also marked the introduction of low-floor light rail vehicles in North America.

In September 1998, revenue service was initiated, on the remainder of the Westside extension, through Washington County to the cities of Beaverton and Hillsboro. In conjunction with the opening of this extension, bus transit service was greatly expanded within Washington County.

In September 2001, the Airport MAX extension opened providing service from the Portland International Airport (PDX) to Downtown Portland.

In May 2004, the Interstate extension opened. The Interstate Max extends the system from the Rose Quarter to the Portland Expo Center.

In September 2009, the Green Line extension opened. This extension provides rail service from Clackamas Town Center into the downtown area.

The latest addition to the light rail network is the Portland to Milwaukie extension, which connects downtown Portland to Clackamas County via the City of Milwaukie. This extension opened in September 2015.

C. LIGHT RAIL SYSTEM

1. Operations

Light rail transit (LRT) service is provided seven days a week from approximately 4am to about 2am. The service design is based on 15-minute headways throughout the LRT

system. 15-minute headways are provided until about 10:30 PM when there is a transition to 30-minute headways. Base operations employs two-car consists on all lines, all days.

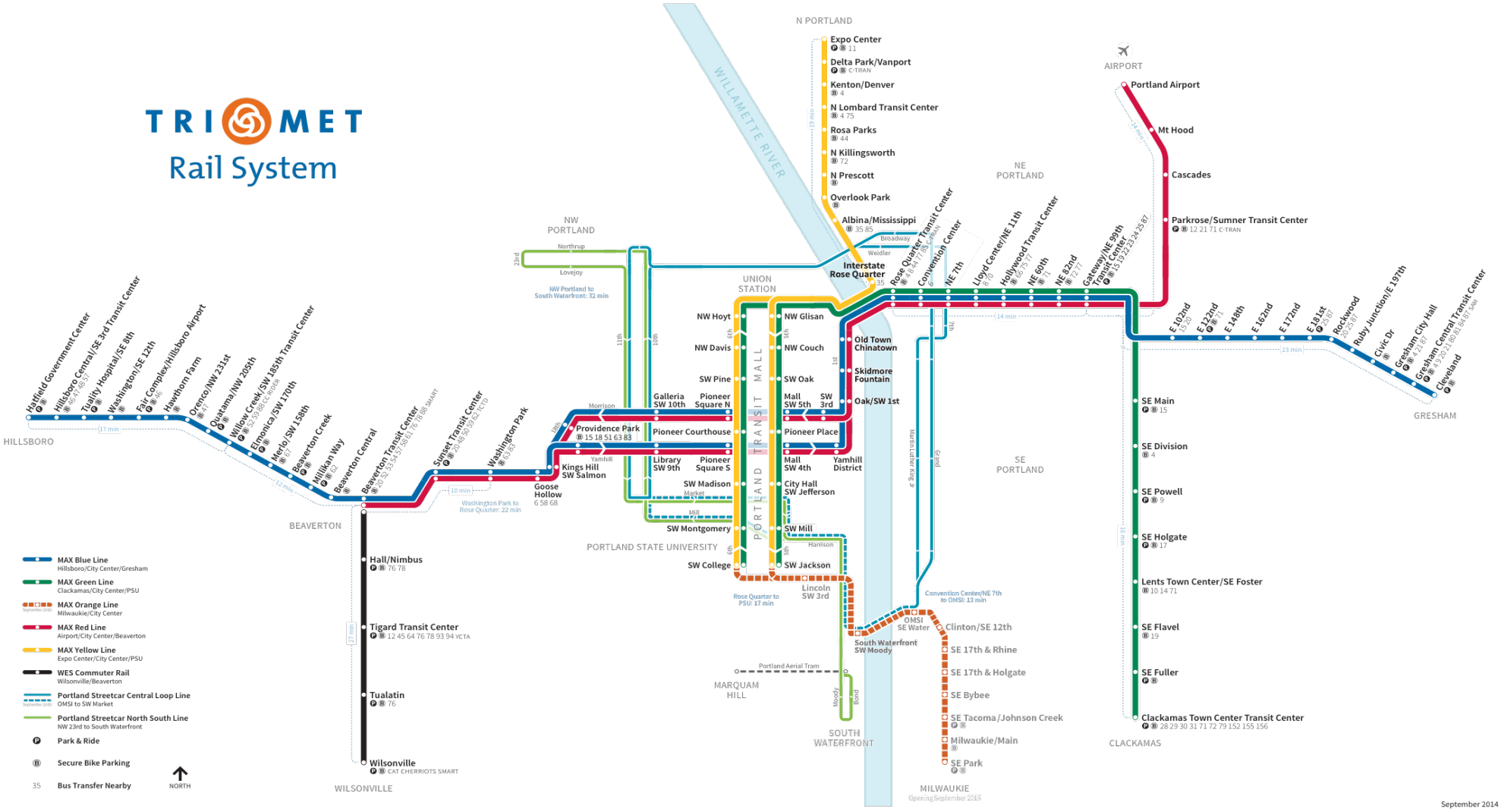
Currently, there are over 123,700 boardings daily on the Blue, Red, Green, Orange, and Yellow lines.

The Rail Operating Rule Book and SOPs are the references for rail operations. The Rule Book and SOPs also provide Rail Operators with specific instructions to be followed in the event of an emergency. The Rule Book and SOPs are revised as needed.

2. Alignment and Routes

TriMet's light rail system has expanded over the years and is now comprised of several service lines. The light rail system has over 60.2 miles of revenue track operating through the cities of Portland, Beaverton, Gresham, Milwaukie, and Hillsboro and unincorporated Clackamas County, Oregon. The downtown Central Business District (CBD) is the center of the system. All five lines provide service to stations in the CBD. The Green and Yellow Lines operate on the Transit Mall on 5th and 6th Avenues, the Red and Blue Lines operate on the "crossmall" alignment on Morrison and Yamhill Streets. The Orange Line terminates at the Jackson Turnaround and transitions to the Yellow Line.

The service lines are referred to by color and are coordinated with TriMet's bus service. Transit Centers, Park and Ride lots and Quick Drop parking spaces are provided along the service lines and support the service. The service lines and a brief description of each are indicated below.


TRIMET
Rail System
MAX Blue Line
Hillsboro/City Center/Gresham
MAX Green Line
Clackamas/City Center/PSU
MAX Orange Line
Milwaukie/City Center
MAX Red Line
Airport/City Center/Beaverton
MAX Yellow Line
Expo Center/City Center/PSU
WES Commuter Rail
Wilsonville/Beaverton
Portland Streetcar Central Loop Line
OMSI to SW Market
Portland Streetcar North South Line
NW 23rd to South Waterfront
Park & Ride
Secure Bike Parking
Bus Transfer Nearby
NORTH
HILLSBORO
BEAVERTON
WILSONVILLE
NW PORTLAND
N PORTLAND
NE PORTLAND
SE PORTLAND
CLACKAMAS
GRESHAM
MILWAUKIE
Opening September 2015
AIRPORT
UNION STATION
PORTLAND STATE UNIVERSITY
MARQUAM HILL
SOUTH WATERFRONT
PORTLAND TRANSIT MALL
WILLAMETTE RIVER
Hatfield Government Center
Hillsboro Central/SE 3rd Transit Center
Triality, Hospital/SE 8th
Washington/SE 12th
Fair Complex/Hillsboro Airport
Hawthorn Farm
Orenco/NW 231st
Quatama/NW 205th
Willow Creek/SW 185th Transit Center
Elmonica/SW 170th
Merlo/SW 158th
Beaverton Creek
Millikan Way
Beaverton Central
Beaverton Transit Center
Sunset Transit Center
Washington Park
Providence Park
Goose Hollow
Kings Hill/SW Salmon
Galleria/SW 10th
Pioneer Square N
Pioneer Courthouse
Library/SW 9th
Pioneer Square S
SW Madison
SW Montgomery
SW College
NW Hoyt
NW Davis
SW Pine
NW Glisan
NW Couch
SW Oak
Mall/SW 5th
SW 3rd
Pioneer Place
Mall/SW 4th
Yamhill District
City Hall/SW Jefferson
SW Mill
SW Jackson
Lincoln/SW 3rd
Old Town Chinatown
Skidmore Fountain
Oak/SW 1st
Hall/Nimbus
Tigard Transit Center
Tualatin
Wilsonville
Expo Center
Delta Park/Vanport
Kenton/Denver
N Lombard Transit Center
Rosa Parks
N Killingsworth
N Prescott
Overlook Park
Albina/Mississippi
Interstate/Rose Quarter
Rose Quarter Transit Center
Convention Center
NE 7th
Lloyd Center/NE 11th
Hollywood Transit Center
NE 60th
NE 82nd
Gateway/NE 99th
Transit Center
Portland Airport
Mt Hood
Cascades
Parkrose/Sumner Transit Center
E 102nd
E 122nd
E 148th
E 162nd
E 172nd
E 181st
Rockwood
Ruby Junction/E 197th
Civic Dr
Gresham City Hall
Gresham Central Transit Center
Cleveland
SE Main
SE Division
SE Powell
SE Holgate
Lents Town Center/SE Foster
SE Flavel
SE Fuller
Clackamas Town Center Transit Center
OMSI/SE Water
Clinton/SE 12th
SE 17th & Rhine
SE 17th & Holgate
SE Bybee
SE Tacoma/Johnson Creek
Milwaukie/Main
SE Park
Portland Aerial Tram
South Waterfront/SW Moody
Rose Quarter to PSU: 17 min
Convention Center/NE 7th to OMSI: 13 min
Washington Park to Rose Quarter: 22 min
NW Portland to South Waterfront: 32 min
September 2014

Blue Line

The Blue Line route is the oldest and longest on the system beginning revenue service in 1986, now with an overall length of 33 miles. The Blue Line is comprised of the 15-mile Banfield segment and the more recent 18-mile Westside segment. The Blue Line route starts at the Cleveland Terminus station in Gresham and serves 50 passenger Stations ending at Hatfield Government Center in Hillsboro. Several of the Stations include Park and Rides and/ or Transit Centers. The Blue Line has yard leads that connect both Ruby Junction and Elmonica Maintenance Facilities to the entire system.

The eastern terminus of the light rail line is located at NE Eighth Avenue and Cleveland Avenue in Gresham, Oregon. From this point, the line runs in a westerly direction for 2.1 miles over the former right-of-way of the Portland Traction Company to Eleven-Mile Avenue. This area is designated as an exclusive right-of-way with periodic grade crossings and train speeds approaching 55 mph.

The line continues westward within the median strip of East Burnside Street for 5.3 miles between Eleven-Mile Avenue and 97th Avenue. This area is considered semi-exclusive right-of-way and street crossings are controlled by standard traffic signals. Trains in this area operate at 35 mph.

At 97th Avenue, the route turns north for 0.6 miles paralleling Highway I-205 between Burnside and Gateway. This area is exclusive right-of-way with train speeds of 35mph.

Turning west and crossing over the I-205 and I-84 freeways, the line runs in a completely grade separated section, between the rights-of-way of the Banfield Freeway and the Union Pacific Railroad, from the Gateway Transit Center Park and Ride, to 13th and Holladay for 4.9 miles. Train speeds within this segment reach 55 mph.

At street level, the route follows Holladay Street on a side-aligned, restricted portion of the street for 0.7 miles. This is semi-exclusive right-of-way controlled by standard traffic lights. Trains operate at speeds of up to 25 mph.

The line crosses the Willamette River via the Steel Bridge, sharing the roadway space with vehicular traffic. The tracks descend the bridge at Everett Street to NW First Avenue, into downtown Portland.

The line continues south, traveling both ways in the median and side aligned on NW First Avenue in semi-exclusive and pedestrian mall types of alignment. The speed in this area is typically 15 mph.

At Morrison Street, the line turns west to 11th Avenue, the former terminus of the original LRT line. In this segment, from 1st Avenue to 11th Avenue, the trains operate one way on the left side of the street, parallel to vehicular traffic. Outbound service is on Morrison Street. Inbound service is one block south on Yamhill Street.

The 11th Avenue Terminus has three tracks connecting Morrison and Yamhill and is still used by various trains operating on the Blue and Red lines.

In the downtown segment of the alignment, light rail tracks are not physically separated from vehicular traffic lanes and are differentiated by pavement treatment and rumble strips. Motorists are not permitted to drive on the tracks between crossings. Crossings are controlled by standard traffic lights. Train speeds typically operate at 15 mph in the downtown segment.

The next segment of the Blue line begins the extension opened to revenue service in 1998. This segment of the light rail alignment continues west, from the former terminus at SW 11th Avenue, westbound along SW Morrison Street, and eastbound on SW Yamhill Street.. At the block bounded by SW Morrison Street and SW Yamhill Street, and SW 17th Avenue and SW 18th Avenue, the alignment turns south, and extends down the median of SW 18th Avenue to Collins Circle.

As in the eastside, downtown segment of the alignment, the light rail tracks are not physically separated from vehicular traffic lanes and are differentiated by pavement treatment and rumble strips. Motorists are not permitted to drive on the tracks. Crossings are controlled by standard traffic lights. Train speeds typically operate at 15 mph.

At Collins Circle the routes turns west, down the south side of SW Jefferson St. This segment is designated as semi-exclusive right-of-way and crossings are controlled by traffic lights.

After passing under SW Canyon Road, trains enter a 3-mile tunnel.

One subsurface station is located in this segment, at Washington Park/Oregon Zoo. The western tunnel portal is located adjacent to the Sunset Highway, at approximately SW 76th Avenue. This is exclusive right-of-way in a tunnel environment. Train speeds approach 55 mph.

The rail line continues along the north side of the U.S. Highway 26 (Sunset Highway) to the northwest sector of the Highway 217 interchange. This area is a continuation of the exclusive right-of-way and train speeds approach 55 mph.

The Sunset Transit Center Station and Park and Ride are located at the Highway 217 interchange. The line crosses under the Sunset Highway and continues along the Westside of Highway 217 to SW Cabot Street. At SW Cabot Street, the rail line turns west, passes by the north side of the Canyon Place Shopping Center, and enters the north side of the Beaverton Transit Center. This portion of the alignment is designated as exclusive right-of-way, except for two gated grade crossings at 114th Avenue and 117th Avenue. Train speeds approach 35 mph in this area.

The route continues west, crossing SW Hall Blvd. and SW Watson Avenue before joining the former Burlington Northern Railroad (BNRR) alignment. The Willow Creek Transit Center and Park and Ride are located at SW 185th Avenue. The rail line continues west, along the BNRR alignment, for approximately 6.2 miles to the intersection of SE 12th Avenue and Washington Street in Hillsboro. This area is designated as exclusive right-of-way with periodic grade crossing protected by crossing gates. Train speeds approach 55 mph in this segment.

The light rail route extends from SE 12th Avenue through downtown Hillsboro along Washington Street to the end of the alignment at Government Center, just west of 1st Avenue. This is area is considered as non-exclusive right-of-way with mixed traffic. Auto traffic is permitted to make left turns from the LRT trainway. Crossings are controlled by standard traffic lights and train speeds approach 20 mph.

Red Line

The Red Line began revenue service in September 2001 and extended service from Gateway Transit Center north 5.5 miles to the Portland International Airport. The Red Line route starts at Portland International Airport and serves 4 stations before joining the Blue Line route were it also serves 24

passenger stations along the Banfield, CBD and on out to Beaverton before reaching the turn back at Beaverton Transit Center. The Red Line serves the Parkrose Transit Center on its extension.

The Red Line begins as a single-track section, just south of the Gateway Transit Center, that initially heads south at grade then enters into a sharp curve that crosses over the I-205 multi-use path and vehicle connector ramps between I-205 and I-84. Due to the configuration of the Loop Bridge train speeds have been restricted to 10 mph. The single-track segment continues to just north of the I-84 overcrossing where it turns into a double track configuration.

The area from the Loop Bridge through Rocky Butte and the existing cut and cover under the northbound lanes of I-205 is all protected right-of-way. Protective fencing separates the LRT from the pathway and existing fencing along I-205. Trains typically operate at 50 mph through this segment.

The route continues from the cut and cover box into the center median of I-205 and continues on to the Parkrose Station's center platform. Train speeds typically will operate at 55 mph through this segment.

A walkway form the North end of the station's platform rises to meet a pedestrian bridge over the northbound lanes of I-205 to the existing Parkrose Park and Ride.

North of the Parkrose Station the rail line continues at grade in the median crossing under Columbia Blvd. and the UPRR Bridge. Just before the I-205 freeway crossing of the Columbia Slough. The flyover bridge begins to elevate to cross over the southbound lanes of I-205. Train speeds on the fly-over bridge will typically be 35 mph.

Trains service two side platforms in the Cascade Station Development, Cascades and Mt. Hood, before making the final stop at the Portland International Airport. There is a single track segment between the area of the Airport Post office and the terminal station. The west end of the LRT station platform is approximately one hundred feet east of the entrance into baggage claim area on the ground level. The track section leading into the Terminal Station has 5 speed trip zones controlled by ATS equipment and bumping posts are installed at the terminus. Speed restrictions into PDX Terminus begin at 30 mph and step down at 5 mph increments to 10 mph.

Yellow Line

The Yellow Line began revenue service in May 2004 and extended service from Rose Quarter Transit Center north 5.8 miles to the Portland Expo Center. The Yellow Line route starts at Portland EXPO Center and serves 10 passenger stations along its route, before joining the Green Line route through the CBD before reaching the turn back at Jackson. The Yellow Line has two Park and Rides on its extension.

The Yellow Line goes northward, just west of the existing Rose Quarter Transit Center, within a median strip of North Interstate Avenue between Multnomah Avenue and Fremont Avenue and is predominantly tie and ballasted track with segments of paved track. This area is considered semi-exclusive right-of-way and street crossings are controlled by standard traffic signals. Trains in this area operate at up to 35 mph.

The second segment of the line continues northward within a median strip of North Interstate Avenue between Fremont and Fenwick Avenue and is paved track. This area is also considered semi-exclusive right-of-way, with only authorized emergency vehicles allowed to enter the raised paved track alignment. Street crossings are controlled by standard traffic signals. Trains in this area can operate at up to 30 mph.

At Fenwick the yellow line make the transition from center to side running and continues north just one more block at which time it enters a dedicated elevated light rail bridge structure called the Vanport Bridge. Trains reach operating speeds up to 55 mph in the long bridge section.

The last section of the Yellow Line runs in an exclusive right-of-way, between the rights-of-way of the I-5 Freeway and EXPO Road in a tie and ballasted track section. Trains service side platforms at Delta Park before making the final stop at the Portland EXPO Center Station. The track section leading into the EXPO Station has speed restricted curves controlling approach speeds and bumping posts are installed at the terminus. Train speeds within this segment reach 35 mph.

Green Line

The Green Line began revenue service in September 2009. The Green line route starts at Clackamas Town Center, through Gateway, and into the CBD. In the CBD it travels north/south from Union Station to Portland State University. Approximately 8.6 miles of track were added for this project.

The I-205 Segment of the Green Line extends south along the I-205 corridor from approximately 1600 LF south of TriMet's existing Gateway Transit Center for 6.5 miles to the Clackamas Town Center. It includes eight stations and five parking facilities.

The double-track, I-205 light rail extension begins at the north end with a fully interlocked double crossover that ties the I-205 segment into the existing Blue Line. Gateway Transit Center is on the Blue and Red Lines at the juncture of I-205 and I-84. At Gateway Transit Center, the two existing lines and the new I-205 line share the existing passenger boarding platforms.

The I-205 light rail extension parallels TriMet's existing Blue Line to just north of Burnside Street where the existing Blue Line turns to the east. The I-205 alignment continues south on the east side of the freeway, passing under the overpass at Burnside. Two cut and cover box structures have been constructed under Stark and Washington Streets just to the east of the existing off-ramps. The alignment continues at grade 1600 LF to the first station and surface Park & Ride facility, located adjacent to Main Street and the Main Street pedestrian overpass. From Main Street, the extension continues south through an at-grade gated crossing (Main Street Park & Ride access road) and pass under the Market Street overpass. The alignment then curves slightly west and passes through an existing 450 LF transit way box structure through which the alignment transitions from the east to the west side of I-205. The extension continues at grade within an existing transit way corridor on the west side of I-205.

The I-205 extension continues under the Division Street overpass to a second station just south of the Division Street overpass. It then continues south onto a new structure crossing over Powell Boulevard to a station and surface Park & Ride facility south of Powell. South of the Powell Station the extension proceeds at grade to an at-grade station and surface Park & Ride facility north of Holgate Street. Progressing south, the alignment passes under the existing Holgate overpass and continue 2600 LF on grade to Harold Street, where it will cross on an overpass. An at-grade station is located north of Foster Road. Upon leaving the station, the alignment crosses SE Foster Road and SE Woodstock Boulevard on structure.

North of SE Foster Road, the light rail alignment is generally located within the existing transit way constructed by ODOT in conjunction with I-205. No designated transit way exists south of SE Foster Road.

South of SE Woodstock Boulevard, the alignment is generally located between I-205 and the existing multi-use path. 2000 LF south of Woodstock, the extension crosses the Springwater Corridor on a new overpass. The alignment continues south over Johnson Creek on a new structure and then across Flavel Street at grade with a gated crossing, to the next station, at-grade just south of SE Flavel Street. The alignment continues south along I-205 and ascends on fill to a structured crossing over SE 92nd Avenue/SE Crystal Springs Boulevard intersection. The descent from the intersection to grade occurs approximately 850 LF south, with the alignment continuing at the base of the I-205 berm, next to the existing bike path.

The I-205 extension continues along the base of the existing berm at grade for roughly 2000 LF where grade separation begins for the crossing of SE Johnson Creek Boulevard on an overpass structure, located to the west of the existing I-205 ramps. A station and surface Park & Ride lot are located south of Conn Battin Road, after which the alignment descends to freeway grade and passes underneath the existing SE Otty Road overcrossing. The alignment continues at grade, between I-205 and the bike path under the SE Monterey Avenue overcrossing. After the undercrossing, the alignment begins its final descent behind the Clackamas Corner shopping center to a terminus station and parking structure in the eastern Clackamas Town Center parking lot. The Clackamas Town Center Transit Center is located just south of the new parking structure with bus layovers on the ground floor of the garage.

The Portland Mall segment of the Project establishes LRT on the existing bus mall on SW 5th and 6th Avenues. The alignment diverges from the existing system at the west end of the Steel Bridge and runs between NW Glisan St. and the Union Pacific Railroad to Union Station. Westbound trains then turn onto Fifth Ave. and travel south through the downtown core, traversing 26 blocks from NW Irving St. to SW Jackson St. The alignment crosses the existing east/west LRT tracks at SW Morrison and Yamhill Streets and the Central City Streetcar tracks at SW Market and Montgomery Streets.

Southbound trains turn around south of SW Jackson St. and proceed northward along Sixth Ave., traveling back through downtown to Union Station and then east to join the existing system at the Steel Bridge. The alignment serves the highest density land use in downtown Portland, including core retail and business centers and major service and entertainment centers such as Amtrak Union Station, Greyhound Bus Station, Pioneer Place Mall, Pioneer Square, Keller Civic Auditorium, Arlene Schnitzer Performing Arts Center and Portland State University.

The overall length of the Mall alignment is 3.4 miles of single track. Fourteen new stations were added (seven on Fifth Ave. and seven on Sixth Ave.), located at NW Hoyt St., NW Davis St., SW Stark St., SW Yamhill St., SW Madison St., SW Mill St., and SW College St.

Orange Line

The Orange Line, the newest light rail alignment, is an approximately 7.3 mile extension serving the CBD, the South Waterfront District, the Central Eastside Industrial District, Southeast Portland neighborhoods, the Milwaukie Town Center, and the urbanized portion of Clackamas County. The entire alignment is double-track to the existing regional light rail network. It adds 10 new stations, approximately 675 park-and-ride spaces, and an exclusive transitway way between SW 1st Avenue and SE 8th Avenue as part of a new bridge across the Willamette River for pedestrians, bicycles, buses, light rail, and potentially streetcar in the future.

The extension connects with the Portland Transit Mall on SW 5th and SW 6th Avenues at SW Jackson Street and head east on SW Lincoln Avenue. Beginning at SW 1st Avenue, the alignment includes a transitway for buses and will veer south on an aerial structure generally along SW Moody Avenue to SW

Porter Street in the South Waterfront District. A new bridge over the Willamette River, Tilikum Crossing Bridge, connects between SW Porter Street and SE Sherman Street adjacent to the Oregon Museum of Science and Industry (OMSI).

From OMSI, the transitway portion of the alignment continues generally south of the Union Pacific Railroad (UPRR) to SE 8th Avenue. The light rail alignment then continues along the UPRR to SE 17th Ave, where it heads south on SE 17th Avenue to SE McLoughlin Boulevard. From SE McLoughlin Boulevard at SE 17th Avenue, the alignment continues south on the eastern edge of SE McLoughlin Boulevard to SE Tacoma Boulevard, where it follows the Tillamook Branch of the UPRR to Lake Road in Milwaukie.

The alignment then crosses Kellogg Lake and SE McLoughlin Boulevard, following that road south to its terminus at SE Park Avenue. Park-and-ride facilities are located at stations near SE Tacoma (320 spaces) Boulevard and SE Park Avenue (355 spaces). The SE Tacoma facility is a surface lot. The SE Park facility is a structured garage.

3. Station Platforms

Stations generally consist of a platform or sidewalk extension, ticket vending and validating machines, shelters and information displays. Station platform lengths are limited to approximately 200 feet due to the size of city blocks in downtown Portland. Boarding height is low-level, approximately 10 inches above top-of-rail.

Well-lit, minimally obstructed platforms allow good visibility for passengers and TriMet personnel. Street level stations have safety bollards and fences to prevent the intrusion of vehicular traffic on to station platforms, and to reduce the tendency for passengers to cross tracks in other than designated areas.

All stations are at street level except for Washington Park, Sunset Transit Center, and Parkrose Stations, and the three stations along the Banfield Freeway – Hollywood (42nd), 60th, and 82nd Avenues. The Washington Park Station is looked within the Robertson Tunnel.

4. Rail Operations and Maintenance Facilities

The center of operations for the light rail system is the Operations Headquarters facility. The facility is located in Portland, Oregon. The building houses the Executive Director Transportation, bus transportation staff, the Operations Command Center for bus and rail operations, report facility for bus operators, and facilities maintenance departments. These departments are responsible for bus and rail operations and field supervision. Rail transportation and maintenance staffs are located at the Ruby Junction Rail Facility in Gresham, Oregon and the Elmonica Rail Facility in Beaverton, Oregon.

Tracks, in the yard area surrounding the Ruby Junction and Elmonica facilities, provide space for the storage of light rail vehicles (LRVs) not in service, and enables movement of LRVs to/from the mainline and through the maintenance shop and car washer. A test track on the east side of the Ruby Junction yard allows testing of brake and electrical systems of LRV's prior to placing back in service following repairs.

Both Ruby Junction and Elmonica facilities have service pits, cranes and other equipment necessary for servicing and maintaining the rail vehicles. Catwalks allow access to the roof of the vehicles. There are storage spaces for spare parts and units required for the maintenance of rail facilities and equipment.

The OCC, located within the Operations Headquarters facility, has the responsibility and capability to monitor and control operations of the rail system and to handle emergency situations that might arise. The OCC is continuously staffed during all hours, 7 days a week. Communications equipment allows Controllers to speak directly with train operators, and maintenance personnel, as well as police, fire, and rescue personnel.

The following functions are performed from the OCC:

- Create and distribute train orders and special instructions
- Monitor train movements and adherence to schedules
- Monitor and acknowledge signals, traction and electrical power, fare collection, communications, and elevator system status and alarms
- Provide 800 MHz radio communications with LRV operators and key staff to provide advance warning and coordination action with other agencies
- Provide telephone communications with key staff in yard, crew room, and in tunnel sections
- Initiate route requests to the signal system.
- Initiate requests to open DC feeder breakers
- Provide transit text messages via reader boards

Additionally, the OCC is able to supervise and control the following functions within the Robertson Tunnel:

- Initiate the operation of any of nineteen pre-defined ventilation operating modes as dictated by train direction of travel, fire zone and passenger evacuation direction planned
- Transmit requests to close specific fire doors on the Washington Park station platform
- Transmit requests to alter the elevator control mode
- Transmit a request to open the fire protection stand pipe flow valves
- Provide emergency communications with emergency responders via telephone
- Monitor the state of tunnel emergency control panels located in the Operations room at the Washington Park station
- Provide public announcements in the Washington Park Station

The Ruby West Vehicle Storage & Maintenance Facility is a 1-story, 2-bay repair facility for the maintenance and storage of non-revenue service vehicles. The facility includes an inspection bay and hydraulic lifts. Ruby West also includes a wash bay for the light rail vehicles.

MOW resides in the Ruby South building. Signals, Overhead Contact System (OCS), Substation, Landscaping and Rail Facility staff work out of this facility. This staff is responsible for maintenance of all systems that allow the train to operate. LRV Maintenance has a flat bay for metal work. The body shop and paint booth is located in Ruby South.

The facility has service pits, cranes and other equipment necessary for servicing and maintaining the rail vehicles. Catwalks allow access to the roof of the vehicles. In addition, this facility has a paint booth.

The Elmonica Operations Facility is a mixed-use building with office space and an LRV maintenance area. The building houses rail operations staff, report facility for train operators, and maintenance of way (MOW) and rail equipment maintenance staff.

The maintenance area consists of maintenance bays, in-floor vehicle jacks, storage tracks, a blowdown pit, and a wash bay. Catwalks allow access to the roof of the vehicles. The building is covered by a complete automatic fire sprinkler system.

The yard area surrounding the operating facility contains the trackage that provides the space for storage of cars not in service and enables movement of vehicles to and from the mainline and through the maintenance shop and car washer.

5. Track

There are three general types of track and special appurtenances utilized on the TriMet system.

Ballasted Track, comprised of 115 lb. AREA rail installed on either timber or concrete ties placed in a ballast trackbed. This type of track may include short walls to contain the ballast. Drainage can include underdrains or trackside ditches. The rail is fastened to the ties with track spikes or l spring clips (Pandrol clip). This type of track is utilized on the private right-of-way portions of the mainline. Ballasted track is also typically used to construct storage tracks at the maintenance facilities.

Direct Fixation Track consists of 115- lb. AREA rail fastened directly to cast-in-place track plinths. The rail rests on resilient plates, called direct fixation fasteners, which are in turn fastened to the plinths through the application of bolts. This type of track is used in selected areas of at-grade private ROW and viaduct structures. Track in TriMet's Robertson Tunnel is a variation of direct fixation track that utilizes precast concrete blocks instead of direct fixation fasteners.

Embedded Track. This track consists of 115-lb. AREA rail, or Ri 59 girder rail. The rail is encased in a rubber boot or elastomeric rail support material and embedded in concrete. This type of track is primarily utilized in locations where "in-street" running occurs.

Crossover tracks and pocket tracks are located at suitable locations to permit trains to turn back at both ends of the system and at selected mid-line locations. Terminal and pocket tracks are used for holding spare vehicles during special events, and provide capability for the temporary storage of malfunctioning trains.

6. Tunnel

General

The tunnel is a twin-bore; the two bores are connected by 19 cross –passages located approximately 750 feet apart from each other. Each cross-passage is protected by 2 pairs of double egress 1-1/2 hour fire rated doors with exit devices. A 30-inch (minimum) wide walkway at 10 inches above top of rail (TOR) is provided on the inside (left side) of each tunnel bore for routine maintenance access and emergency egress.

The tunnel bores are protected by a dry standpipe water system. The standpipe system has fill points at the Washington Park Station headhouse and the West Vent shaft building and can be filled either locally or remotely from the Washington Park or the Ruby Junction Command Center.

Emergency lighting is provided to permit passenger egress from the station and tunnel areas during a loss of utility power.

The station consists of two 200 feet long platforms connected by diagonal cross passages and elevator lobbies at the east and west ends. Platform lobby areas and diagonal cross passages are equipped with fire rated doors on each side. The OCC remotely controls the doors. During an emergency, the doors to the incident platform are closed to isolate it, and keep smoke and heat away from the non-incident platform areas.

Two vertical shafts connect the platform level with the headhouse structure at the surface. Each shaft includes two high-speed elevators, station air ducts, tunnel ventilation fan ducts, and exit stairs. The headhouse structure includes the elevator entrances, fan rooms, electrical rooms, and an Operation Room. The Operations Room supplicates some of the control functions of the OCC at Ruby Junction and will be use during emergency incidents and during high station use periods.

The Operations Room is an emergency control center located within Washington Park Station. TriMet and emergency response personnel staff the room during emergency incidents. It may also be staffed during high station use periods. If communication is lost between Ruby Junction and the tunnel, a Supervisor is dispatched to the Operations Room and will remain on site until communications have been restored. In the event that any of the Tunnel Fire/Life Safety and Security equipment needs to be activated, the Supervisor on site will do it through the onsite control panels.

Tunnel Ventilation

The basic goals of the tunnel and station ventilation system in a fire or smoke emergency is to:

- Assist in the safe evacuation of passengers from a disabled train and provide emergency personnel with access to the site, by controlling the movement of both smoke and heat
- Supply outside air in the evacuation path and provide airflow in sufficient quantities to prevent back flow of hot, smoke-laden air
- Facilitate purging of smoke after a fire or smoke incident

An electronically supervised and zoned fire detection alarm and control system serves the Washington Park station and the West Ventilation shaft. The system consists of a Fire Management Panel , a Fire Alarm Relay Panel, and other support equipment/devices such as manual alarm pull station, smoke and heat detectors, elevator recall, gaseous fire suppression systems, sprinkler water flow switches, fire water valves and fire door release.

7. Light Rail Vehicles (LRV)

TriMet operates the light rail vehicle fleet to handle the ridership demands. The light rail vehicle fleet consists of self-propelled, six axle, articulated, electrically powered rail cars. Each car is completely equipped for bi-directional operation except for the Type 4 and Type 5 LRVs. The vehicles are capable of multiple unit operation of up to four cars, using any combination of cars, except for the Type 4 and Type 5 LRVs, which may only be coupled together. Operations, however, are restricted to two cars due to the short blocks in downtown Portland. The vehicles are powered by means of an OCS, which supplies 750 volts DC electricity to power the cars. The light rail vehicles are capable of speeds up to 55 mph, with an average speed of 21 mph.

The light rail cars are designed to be "fail safe" so that failure of any safety critical component automatically stops the train or causes it to run at a safer, more restrictive speed. Train design prevents car movement if a side door is not closed and locked. Passengers can, however, open car doors to evacuate the train in an emergency. Additionally, in the event the operator fails to regain control of the light rail vehicle the "dead man" feature is activated; an irretrievable brake application is initiated.

Fire resistant materials are used throughout the cars and fire extinguishers are provided. Emergency battery power provides communication, emergency car lighting, and headlights and tail lights if traction power is lost. The on-board public address system allows the Operator to communicate emergency instructions or other information to passengers inside or persons outside the vehicle.

Description		From	To	Mfr	Yr
Type I	High Floor Light Rail Vehicles	101	126	Bombardier	1983-86
Type II	Low Floor Light Rail Vehicles (LFLRV)	201	252	Siemens	1995-99
Type III	Low Floor Light Rail Vehicles (LFLRV))	301	327	Siemens	2002-04
Type IV	Low Floor Light Rail Vehicles (LFLRV)	401	422	Siemens	2008-09
Type V	Low Floor Light Rail Vehicles	501	518	Siemens	2015
Total LRV Fleet = 145					

8. Traction Electrification System (TES)

A nominal 750-volt direct current (VDC) traction power system, consisting of a power conversion and distribution system, provides propulsion to the light rail vehicles. High voltage alternating current (12.5 kVAC) is converted to 750 VDC at substations and is then fed through protective switching equipment to the distribution system. The distribution system is composed primarily of a contact wire above each track, together with associated feeder cables, support poles, and other components. To provide power reliability, adjacent substations supply each segment of contact wire with electrical power.

The OCS consists of all equipment from the interface with the traction power substation positive feeders to the interface with the light rail vehicle pantograph. All OCS equipment is energized at a nominal 750 VDC, and is double insulated. A minimum of two levels of electrical insulation is provided between the contact wire and a line pole or other grounded structure.

The OCS system includes the following types of configurations:

- Single contact fixed termination system consists of a single contact wire with fixed terminations. The contact wire is supported by t cross-spans, headspans, cantilevers, and shop supports. This system is used in the maintenance facilities and storage yards and interfaces with the simple auto tensioned catenary on the yard lead tracks.

- Weight tensioned single contact wire or trolley wire system consists of a single contact wire tensioned by means of counterweights or spring tensioners and supported from cross-spans by rollers and bridles or from cantilevers, This system is used exclusively in the downtown Portland CBD and downtown Hillsboro (10th Street to Government Center) environments.

- Simple fixed termination catenary system consists of both a contact and messenger wire with fixed terminations. This system interfaces with the single contact wire auto tensioned system near the East Portal of the tunnel, and continues through the 3 mile tunnel interfacing with weight tensioned catenary system in the West Portal area. The catenary is supported from cantilevers and tunnel roof supports.

- Simple auto tensioned catenary system consists of both a contact and a messenger wire tensioned by means of counter weights. Messenger wire is suspended from cantilever arms, headpans, or bridge supports. The contact wire is supported from the messenger wire by hangers at regular intervals to produce a contact surface nearly parallel to the top of the rails. The route covered by this type of catenary system is mainly open track. This system runs from the terminus in Gresham to Rose Quarter, where it interfaces with the auto tensioned single contact wire system. The system resumes west of the

tunnel and continues to 10th Avenue in Hillsboro. Additionally, the 5.5-mile Airport MAX extension, the 5.8-mile Interstate MAX extension and the 6.6 mile I-205 Green Line extension employ this system type.

- Some modifications to these common systems include the catenary system at Sunset Transit Center, which has been modified to accommodate the cut and cover box and tight radius curve, with the inclusion of messenger and contact wire tension reducers for each track at the beginning and end of the area. A double crossover, included in this area, incorporates a single fixed termination contact wire system because of clearances and wiring arrangements. The catenary arrangements at Rocky Butte Tunnel and Greeley overpass employ parallel contact wires in limited clearance areas.

15kV System

The 15kV system provides power for running the trains and all systems within the tunnel. The system includes:

- Approximately six miles of multi-conductor, metal-clad cable throughout each of the two tunnel tubes and up the vertical shafts at the West Vent Shaft and Washington Park Station
- Multiple sections of metal-clad switchgear at the East Portal, West Portal, West Vent Shaft and Washington Park Station
- A 750kVA single-ended unit substation at the West Vent Shaft and 2000 kVA double-ended unit substation at the Washington Park Station.
- A unit substation at the Sunset Transit Center

All TES substations have DC breakers and separate disconnect switches for individual track sections. Various AC and DC circuit breakers protect substation equipment. When a fault or overload occurs, circuit breakers and relays operate automatically to disconnect power instantaneously. Additionally, the circuit breakers and relays can be controlled from panels within the substations. If a fault occurs on the AC side of the equipment, the feeders disconnect. Normal operation, however, can be maintained with the DC breakers closed, acting as a tie station. Battery backup for ten hours is provided for control equipment in the substation, in the event of loss of supply power.

The Operations Command Center can remotely open the DC circuit breakers at each TES substation to isolate each electrical section. For safety reasons, these breakers cannot be remotely closed. They must be manually closed by qualified technicians. The DC circuit breakers that feed each electrical section within the tunnel, however, can be opened and closed remotely by the Operations Command Center or at the operations catenary control panel located at the Washington Park Station.

Additionally, each substation has an emergency shutdown disconnect that opens the AC and DC breakers, and transfers the signal to the adjacent substations causing the OCS to be disconnected from the power supply. The emergency shutdown disconnect can only be activated at the substation itself.

To provide operational flexibility, the overhead is divided in sections, which are separated by section insulators, insulated overlaps or airbreaks. Pole mounted switches in the vicinity of the section insulators enable the power from a specific section of track to be de-energized.

9. Signal System

Railroad signal techniques are used to enhance safety and improve efficiency in the operations of trains. Circuit design conforms to the “American Railway Signaling Principals and Practices” of the AAR Communications and Signals section. Signal system functions include:

- Protection and control of track switches
- Protection and control of bi-directional train operation
- Protection for following trains operating with the normal current of traffic
- Highway grade crossing warning

The signal system includes:

- An automatic block signal (ABS) system to satisfy both present and future headway requirements.
- An automatic train stop (ATS) system to automatically apply train-braking systems if a train passes a red signal.
- Train to wayside communications (TWC) system to:
- Automatically call routes through interlockings
- Update the Operations Command Center computer system as to the locations of light rail vehicles
- Pre-empt intersection traffic control signals
- Call (request for routing) switches in TriMet's Ruby Junction and Elmonica Operations Facility yards.
- Speed control zones, where train entry speed into sharp curves and/or passenger stations is controlled and enforced by the use of Automatic Trip Stops.
- Grade crossing warning systems at highway grade crossings.

The purpose of the ABS system is to automatically control train operations and provide safe clearances and stopping distances in areas of high-speed train operations (Up to 55 mph). The ABS system is used in the following segments:

Blue Line

- Eleven-Mile Avenue to the Gresham Terminus
- Lloyd Center Station to Gateway Transit Center, along the Banfield Freeway
- East Portal of Robertson Tunnel to Hillsboro

Red line

- System extension from Gateway Transit Center to Portland International Airport

Yellow line

- System extension from Rose Quarter to Albina
- Kenton to Expo

Green Line

- Gateway to Clackamas Town Center

Orange Line

- Holgate Ave to Park Ave

Continuous track circuits throughout the block and an area (overlap) control signals not less than the safe braking distance in advance of the next signal. Safe braking distances are calculated using a two second vehicle reaction time, a deceleration rate on level tangent track of 1.95 mphs, and a 35 % (distance) safety margin. Track circuits for train protection are shunt-type, phase selective, 60 or 100Hz, with impedance bonds and two-element vane relays.

The TriMet ABS system uses multi-aspect signals.

In addition to track circuits for the detection of train occupancy, signals are controlled in regard to the condition of any track switch in the block or overlap. A red signal is displayed, in the block or overlap, when any of the following conditions occurs:

- A leading train is occupying the track.
- The switch points are not in position for safe train movement.
- A hand-operated switch is not in the fully normal position.
- A switch-and-lock movement is not fully locked.
- Electric switch-locking arrangements are not normal and locked;
- The selector lever of a dual-control switch-and-lock movement is not in "MOTOR" position.

No signal displays an aspect less restrictive than the approach when the next signal in advance displays an aspect requiring a stop.

Three-aspect, non-interlocked signals display a “proceed” aspect when the next signal in advance displays an approach aspect.

Interlockings are provided for the protection of all powered switches. Detector time, route and approach locking is provided. Detector locking remains in effect for a minimum of five seconds after the slow pick up track repeater relays close their front contacts.

The signaling system is bi-directional in the Robertson Tunnel, in areas of single track (e.g. Redline near the Airport), and at the various line terminals (e.g. Expo, Portland Airport). Bi-directional operations on other areas of the line are performed using manual blocks.

A more detailed explanation of the signal system may be found in the Rail Transportation Standard Operating Procedure (SOP) 401, “Automatic Block Signal System (ABS)”.

All interlocking signals and ABS signals, as well as some selected signals in paved track sections, are equipped and enforced with automatic train stops (ATS). The ATS system provides safety assurance by not permitting a train to occupy a segment of track already occupied by another train in ABS territory, not allowing train speed to exceed predetermined safe limits or inappropriate position of a switch.

ATS protection is accomplished through carborne and wayside ATS equipment. The wayside trip stop is a magnet that is active at all times, unless the signal governing movement over the magnet is displaying a permissive aspect. If a train violates a red aspect, it is automatically tripped by the ATS, placed in an irretrievable maximum brake to zero, forced to wait at rest for 20 seconds, and an on-board counter is indexed. Standard operating procedure is that train operators are to report immediately any trip stop violation to the Operations Command Center. The LRVs include the feature

that automatically annunciates a trip stop violation to the Operations Command Center via the 800 MHz radio system

A Train-to-Wayside Communications (TWC) system is used as a primary method of entering route and switch requests. The TWC system consists of a wayside transceiver and an LRV carried transponder. Thumb-wheel switches and push buttons in each LRV cab are provided to train operators to enter the route number and train number of their consist and other requests such as switch call and traffic sign preempt call. TWC wayside equipment is provided at all interlockings, at all passenger stations adjacent to highway crossings, and at al power switches in the yard.

Crossing gates and flashing signals are used to control grade crossings along the right-of-way in the following segments:

- Eleven-Mile Avenue to Cleveland Avenue (Blue Line)
- SW 114th in Beaverton to SE 12th Avenue, (Blue Line)
- Cascades Station to Portland Airport, (Red Line)
- Main Street station park and ride access road, (Green Line)
- Flavel Street (Green line)
- OMSI to Park Ave, except at segment between SE Pershing to SE Mall (Orange Line)

The operation of the crossing gates and flashing lights is initiated by the presence of a train approaching the grade crossing. In addition to the crossing gate approach circuits, island circuit are used to insure that the gates will be lowered and remain lowered when a train occupies that section of track, with in the crossing area. There are a total of thirty-six gated crossings.

In the Burnside Street, Portland Central Business District, Holladay Street and Hillsboro downtown operating areas, a pre-empt traffic signal system is in effect. The system prioritizes train movements through signalized intersections through the train-to-wayside communication system. Upon detection, a signal is sent to the traffic controller to give a clear movement signal to the LRV. All conflicting traffic movements are stopped until the train clears the intersection.

10. Communication System

The communications system provides a means of exchanging information in real time between the OCC and light rail passenger stations, tunnel sections, Washington Park Operations Room, wayside TES substations, train signals rooms, and communications rooms. This enables the OCC to supervise the entire TriMet light rail system.

Intrusion detection systems have been installed at a few key locations on the light rail system. A zoned summary alarm is sent to the OCC should the system detect an intrusion.

The OCC is also able to monitor station platforms, elevators, and lobbies by means of CCTV cameras. The OCC also has the capability to inform and advise passengers by means of reader boards (text messaging). Transit Tracker signs are capable of displaying “text only” or “text with audio” (the sign automatically speaks any text that is displayed on the sign. Reader boards are being phased out and replaced by the Text and Audio capable Transit Trackers. CCTV and/or Transit Trackers are available at many stations.

Radio transmission is through a 700 MHz radio network. The OCC is linked to the Portland’s 911 control center. The radio system provides a communication link between train operators, rail/road Supervisors, and maintenance personnel.

D. BUS SYSTEM

1. OPERATIONS

TriMet operates 668 transit buses to handle ridership demands of 198,000 weekday trips throughout the urbanized tri-county area. Eighty-three bus routes serve TriMet customers; most of the lines are routes radiating from downtown Portland. The Portland Mall consists of exclusive lanes for buses on 11 blocks each of Southwest Fifth and Sixth Avenues in the heart of the downtown area. Buses traverse 75,891 service miles on a typical weekday.

The Portland Mall consists of exclusive lanes for buses that extend south on SW Fifth Avenue and north on SW Sixth Avenue in the heart of downtown. Other lines serve as cross-town feeder routes to the light rail system.

Bus lines operate 22 hours a day, seven days a week. During peak hours, most routes operate every 5 to 15 minutes. Off-peak, most buses operate on 20 to 30 minute headways.

Mini-buses provide community-base transit service to residential or business loops in Beaverton, Gresham, and Oregon City

2. BUS FLEET

The number of buses in TriMet's bus fleet is determined by the projected annual bus schedule requirements with an additional 15% for spares to account for buses in maintenance and inspection or awaiting repairs.

The fleet consists of the following buses:

	Veh. #		Year
Description	From	To	Built
GILLIG PHANTOM ADB (30')	1601	1643	1990 - 1991
FLXIBLE METRO ADB (30')	1901	1910	1992
NEW FLYER LF (40')	2001	2022	1997
GILLIG PHANTOM ADB (40')	2101	2165	1997
NEW FLYER LF (40')	2201	2318	1998 - 1999
NEW FLYER LF (40’)	2501	2560	2000 - 2001
NEW FLYER LF HYBRID (40’)	2561	2655	2002
NEW FLYER LF (40’)	2701	2725	2003
NEW FLYER LF (40’)	2801	2839	2005
NEW FLYER LF (40’)	2901	2940	2009
GILLIG BRT HYBRID (40’)	3001	3051	2012
GILLIG BRT (40’)	3052	3055	2012
GILLIG BRT (40’)	3101	3170	2013
GILLIG BRT (40’)	3201	3260	2014
GILLIG BRT (40’)	3301	3330	2014
GILLIG BRT (40’)	3401	3422	2015
GILLIG BRT (40’)	3056	3059	2015
GILLIG BRT (40’)	3261	3268	2015

	Veh. #		Year
Description	From	To	Built
GILLIG BRT (40')	3501	3577	2015
GILLIG BRT (40')	3601	3650	2016
GILLIG BRT (40')	3701	3757	2017

All TriMet buses are equipped with fire extinguishers and two-way radios for emergency communications.

Buses also have silent alarms for operator/passenger protection.

3. BUS DISPATCH CENTER

The Bus Dispatch Center, part of the OCC, is located in the Operations Headquarters facility and is equipped to maintain radio contact with the active fleet. The Dispatch Center acts on operator requests for maintenance or emergency assistance, and coordinates accident responses by TriMet and local emergency response personnel. The center also coordinates bus service support required as a result of extended disruption of light rail service.

4. YARD/MAINTENANCE SHOPS

TriMet maintains three combination yard/maintenance shops:

- Center Street
- Powell
- Merlo Road

These facilities serve as dispatch points for bus service and provide for the cleaning, inspection, and maintenance of buses.

Each shop has the facilities, tools and equipment for bus repair and overhaul. The Center Street and Merlo Road facilities have the facilities to repair major damage. Center Street has the additional facilities for engine and transmission rebuilding.

E. PARATRANSIT SYSTEM

1. OPERATIONS

TriMet operates a fleet of 254 lift-equipped mini-buses and 15 sedans used to deliver LIFT service. LIFT provides approximately 3800 weekday rides, 1400 rides on Saturday and 1300 rides on Sundays and Holidays. Lift provides service between 4:30am and 2"30 am, seven days per week, 365 days per year.

The LIFT fleet buses are equipped with Ricon, Braun or Maxon lifts, are 25 feet in length, and have a life cycle of 10 years. It is TriMet's goal to maintain a minimum 15% spare ratio for the overall LIFT fleet.

2. LIFT DISPATCH CENTER

The TriMet LIFT Program operations include a central dispatch center, a central maintenance garage and three transportation centers.

LIFT Central Dispatch, located at the NELA facility in NW Portland receives ride requests, schedules and dispatches rides; and responds to customer contacts.

LIFT Central Maintenance also located at the NELA facility performs all vehicle maintenance, excluding those minor maintenance activities specifically outlined as the responsibility of the LIFT Transportation.

Two additional transportation facilities are located in SE Portland and Beaverton.

F. TRANSIT CENTERS, PARK & RIDES, AND PARKING GARAGES

TriMet maintains 18 transit centers, 70 park and ride lots, and approximately 900 bus shelters. The transit centers are located in important hub locations for multiple bus lines or multiple bus lines and light rail stations. Forty-three (43) of the Park and Ride lots are shared-use facilities; often church parking lots are made available to transit users during the work week. TriMet owns and maintains an additional 27 Park and Ride lots.

Additionally, TriMet owns and operates three multi-level parking garages.

The Gresham Garage is a 4 story park & ride facility with approximately 500+ parking spaces. The building is of Type-II, 1-hour construction with a Class I dry standpipe system.

The Sunset Transit Center Parking Garage is a 3 story park & ride facility with approximately 595 parking spaces. The building is of Type-II, 1-hour construction with a Class I dry standpipe system. Attached to the upper level of the garage is a pedestrian over-crossing structure spanning US Highway 26, providing access to the Sunset Transit Center for foot traffic.

The Gateway Transit Center garage is a 4 story park & ride facility with approximately 400+ parking spaces.

The Clackamas Transit Center garage is a 4 story park& ride facility with approximately 700 parking spaces.

G. INTERFACE WITH PORTLAND STREETCAR

Portland Streetcar is managed and Operated by the City of Portland, and is supported by TriMet. TriMet supplies Rail Operators, Supervisors and Rail Maintenance Staff. In addition, TriMet maintains the trackway and OCS.

MAX and Streetcar tracks intersect in eight locations: 5th and Market, 5th and Montgomery, 6th and Mill, 6th and Market, 10th and Morrison, 10th and Yamhill, 11th and Morrison and 11th and Yamhill. All eight locations are signalized.

APPENDIX B: SAFETY COMMITTEES

1. Transportation and Maintenance Safety Committees

Purpose

The purpose of TriMet's Bus and Rail Maintenance and Transportations Safety Committees is to bring management, employees and employee representative together to achieve and maintain a safe, healthful workplace.

Goals

- Evaluate employee concerns about safety and security hazards
- Assist in identifying and reporting hazards in the workplace
- Review injury reports and provide recommendations to reduce reoccurrence
- Assist with workplace inspections

Objectives

- Address concerns and recommend mitigation
- Provide management with information concerning hazards and provide recommendations for mitigation
- Reduce reoccurrence of injuries to employees

Membership

Safety Committees include management, employees, a SSES representative and employee representatives. The Committee will be made up of applicants, but management may appoint persons if no applicants are available. If multiple persons apply for membership, the existing committee will elect members. Committee membership is an option for any staff member.

Committee members are expected to serve a minimum of one year.

Officers and Representative

Each committee will have a Chairperson, elected by the committee members. The Chairperson will be responsible for conducting meetings, establishing an agenda and selecting the time and place of the meeting. The Chairperson will send out meeting notices on a monthly basis
Each committee will have a Recording Secretary. The Recording Secretary is responsible for producing and retaining all documentation. This includes documenting meetings and producing meeting minutes, maintaining files, and posting minutes. All documentation will be retained electronically for a minimum of three years. In addition, the Recording Secretary will document any hazards found in the Safety Inspections and track any recommendations to resolution.

Each committee will include a member of the SSES. This person will be responsible for bringing injury documentation to the monthly meetings and leading safety inspections.

All other member of the committee are responsible for reporting employee concerns and hazards, providing recommendations to mitigate hazards, and participating in facility inspections.

Training

All members of the Safety Committee will be trained in hazard identification.

Meetings

Meetings will be held at least quarterly and may include program reviews, injury reviews, and reviews of employee concerns. All decisions involving change will be voted on by the committee members. The Committee may elect to bring issues to the attention of the TCRC.

Facility inspections may be conducted instead of a regular committee meeting. All members of the Safety Committee can be part of the inspection team.

Employee Involvement

Employees may, verbally or in writing, share a safety/security concern with a Safety Committee member who will bring the concern to the attention of the committee. Any Safety Committee member can bring employee concerns to the Safety Committee. If the Committee members believes that an employee concern has identified a hazard that might result in immediate injury to any employee, he/she may contact their Supervisor or a member of the Safety/Security Department.

Incident/Injury Investigation

Safety Committee members will review injuries and reported “close calls”. Any recommendations will be sent to the effected manager by the Chairperson. All recommendations will be tracked by the Recording Secretary.

Workplace Inspections

Inspections will be conducted on a quarterly basis. All Committee members will participate in these inspections. The member of the Safety/Security Department serving on the committee will direct and assist committee members.

2. Safety and Security Committee

The purpose of the Safety and Security Committee is to assist in the detection and elimination of unsafe conditions and work practices that may lead to accidents and injuries to the general public and TriMet employees.

A Committee is created for each new rail extension. Members of the committee include the Project Manager, Operations Support, Rail Transportation, a Safety Representative and Maintenance of Way. ODOT and PDOT are invited to attend on as as-needed basis.

The committee reviews the design and works with the Project Manager to identify and eliminate hazards and must approve the design.

3. Transit Change Review Committee

The purpose of the Transit Change Review Committee is to review and approve all proposed changes and modifications to the existing bus and rail system. Any additions, modifications, or deletions to Bus or Rail Operations Standard Operating Procedures (SOPs), any changes to the System Safety Program Plan, and to the existing configuration of operating bus or rail system fixed facilities, rolling stock, and equipment directly related to operation of rolling stock, must be reviewed and authorized by the TCRC. These reviews are established to ensure that system and operational changes are approved prior to implementation, and those drawings, manuals, and other related documents, including training programs, are updated to reflect these changes.

The TCRC also reviews all serious or potentially serious accidents.
TCRC meets monthly, but special sessions may be held on an as needed basis.

Membership includes managers and directors from bus and rail maintenance, bus and rail operations, field operation, SSES and project implementation

4. Fire/Life Safety/Security Committee

The purpose of the committee is to identify and work through issues related to the new rail extensions; a committee is formed for each new start. The committee develops lists of potential issues related to the project and identifies mitigations and solutions to those problems/issues.

The committee is comprised of stakeholders affected by the project, as well as assisted by members of the TriMet Capitol Projects team assigned to various segments of the alignment. These stakeholders may include representatives from the City of Portland, Sheriff's Office, Fire & Rescue, TriMet Transit Police, TriMet Operations Support, TriMet Field Operations, TriMet Maintenance of Way, TriMet Rail Equipment Maintenance, TriMet Facilities Maintenance, TriMet Community Relations, TriMet Bus Transportation, and/or TriMet Rail Transportation

5. Bus and Rail Accident Review Committees

These committees are composed of two Operators, two Trainers, one Union Representative and a representative from Safety.

The Bus Review Committee meets twice per month and reviews all bus accidents, with respect to preventability. Any hazards noted, such as stop placement or overgrown vegetation is referred to the party responsible for assessment and mitigation. This could include referral to the TCRC, one of the Safety Committees, or a specific department. Any issues with the actions of the Operator are referred to the training department.

The Rail Review Committee meets once per month and reviews all rail accidents with respect to preventability. Any hazards noted, such as stop placement or overgrown vegetation is referred to the party responsible for assessment and mitigation. This could include referral to the TCRC, one of the Safety Committees, or a specific department. Any issues with the actions of the Operator are referred to the training department.

6. Continuous Improvement Teams

Continuous Improvement Teams (CIT) are temporary teams of managers, supervisors, and frontline employees assembled to address specific safety and security issues. The teams are temporary, typically

lastly several months; until the team actions are fully implemented. CITs have addressed roadway worker protection, bus ergonomics, operator assaults, and rail rule book modifications.

APPENDIX C: ACRONYM LIST

AAR – Association of American Railroads

ABS – Automatic Block System

ACID - Accident Incident Database

APTA - American Public Transportation Association

ATS – Automatic Train Stop

BNRR – Burlington North Railroad

CAP – Corrective Action Plan (s)

CBD – Central Business District

CCTV – Closed Circuit Television

CFR – Code of Federal Regulation

DHA - Detailed Hazard Analysis

DHS – Department of Homeland Security

EMP – Emergency Management Plan

EOC – Emergency Operations Center

FRA – Federal Railroad Administration

FTA - Federal Transit Administration

LRT – Light Rail Transit

LRV - Light Rail Vehicle

IC – Incident Commander

ICS – Incident Command System

ITAP – Internal Safety Audit Process

MMIS – Maintenance Management Information System

MOW - Maintenance of Way

MSDS - Material Safety Data Sheets

NIMS – National Incident Management System

NTSB – National Transportation Safety Board

OAR – Oregon Administrative Rules

OCC – Operations Command Center

OCS – Overhead Contact System

ODOT - Oregon Department of Transportation

OSHA – Occupational Safety and Health Administration

PDOT - Portland Department of Transportation

PPE - Personal Protective Equipment

PPTW – Pedestrian Part Time Warning

PHA - Preliminary Hazard Analysis

RDPO – Regional Disaster Preparedness Organization

RSA – Request for Safety Assessment

SMP – Security Management Plan

SSES – Safety, Security and Environmental Services

SOP - Standard Operating Procedure

SIP – Service Improvement Process

SMIS – Safety Management Information System

SMP – Safety Management Plan

SSPP - System Safety Program Plan

TCRC – Transit Change Review Committee

TES – Traction Electrification System

TriMet - Tri-County Metropolitan Transportation District of Oregon

TWC – Train to Wayside Communications